HP ProLiant DL180 Gen9 Server User Guide

Abstract

This document is for the person who installs, administers, and troubleshoots servers and storage systems. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels.

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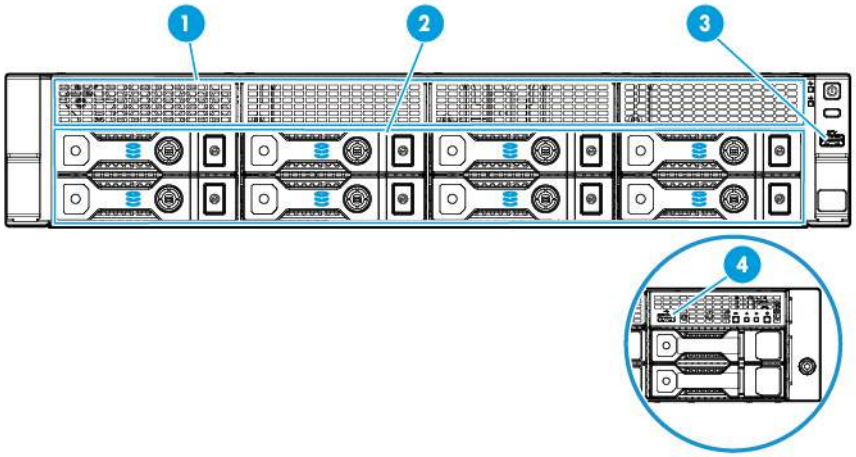
Component identification

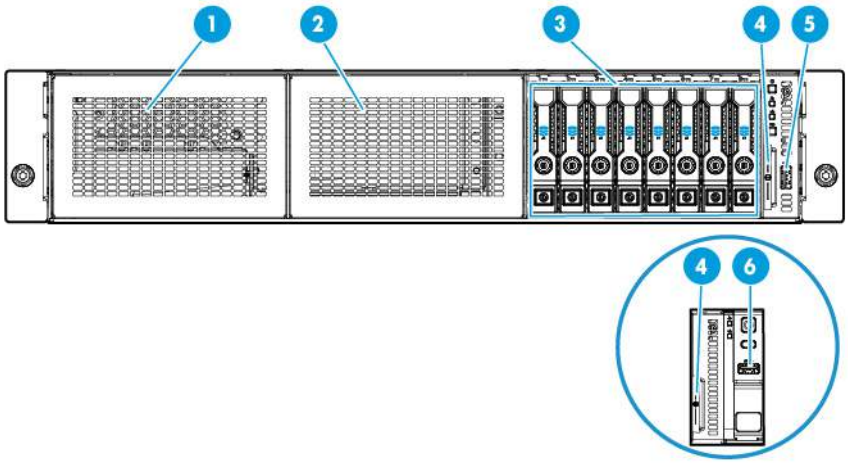
Front panel components

- 8-bay LFF drive model



Item	Description
1	4-bay LFF drive cage (box 1)
2	8-bay LFF drive cage (box 2)
3	USB 3.0 connector (in servers using quick-release latch rack ears)
4	USB 2.0 connector (in servers using thumbscrew rack ears)

- 8-bay SFF drive model



Item	Description
1	HP Universal Media Bay (box 1, for the optical drive cage option)

Item	Description
2	8-bay SFF drive cage bay (box 2, for the second 8-bay SFF drive cage option)
3	Fixed 8-bay SFF drive cage (box 3)
4	Serial label pull tab ("Serial label pull tab information" on page 8)
5	USB 2.0 connector (in servers using thumbscrew rack ears)
6	USB 3.0 connector (in servers using quick-release latch rack ears)

Serial label pull tab information

The vertically oriented serial label pull tab in the SFF chassis is double-sided. The following server labels are attached to this pull tab:

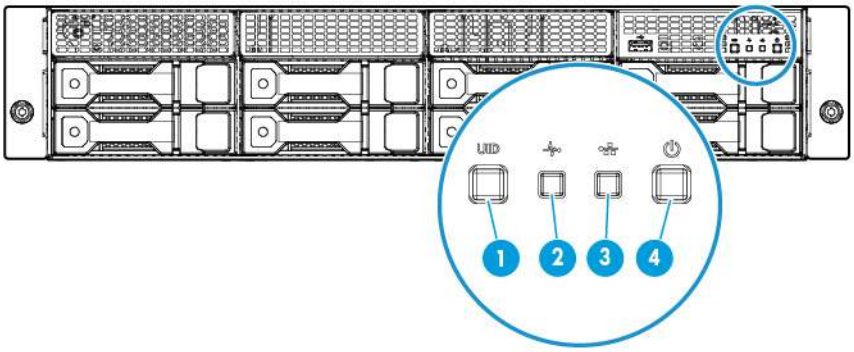
- Left side—Server serial number label and the customer asset tag label
- Right side—Default iLO account information label and the QR code label

  Use your mobile device to scan the QR code label to display the server mobile product page (http://www.hp.com/qref/dl180gen9). This page contains links to server setup information, spare part numbers, QuickSpecs, troubleshooting resources, and other useful product links.

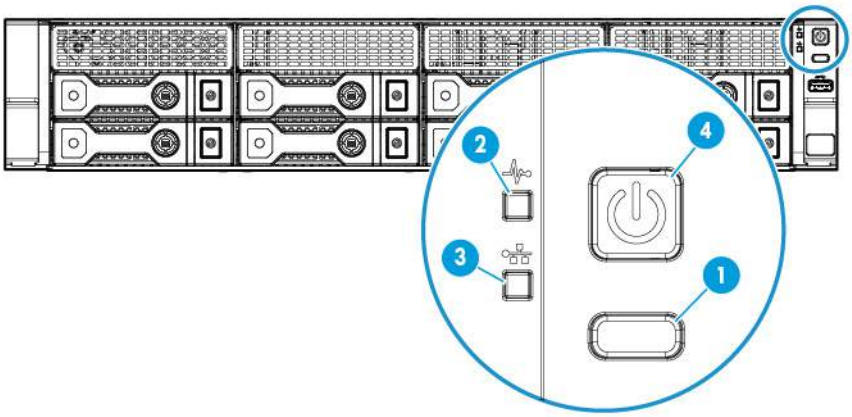
In the LFF chassis, these server labels are attached on the front edge of the access panel instead.

Front panel LEDs and buttons

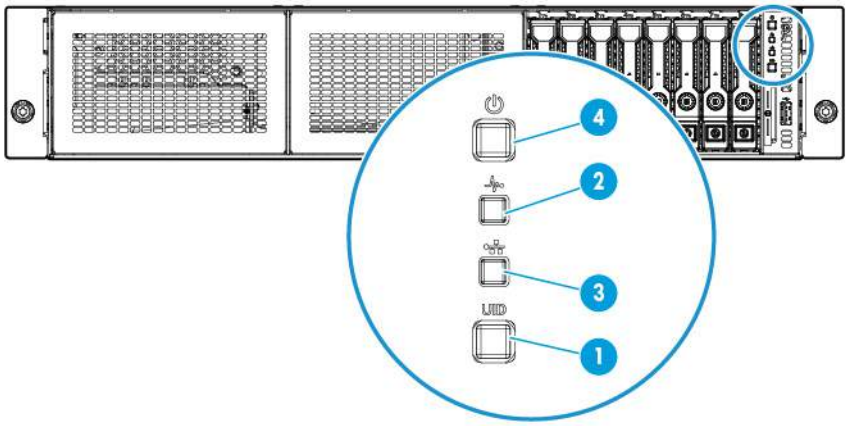
- Front panel LEDs and buttons in an LFF chassis with thumbscrew rack ears



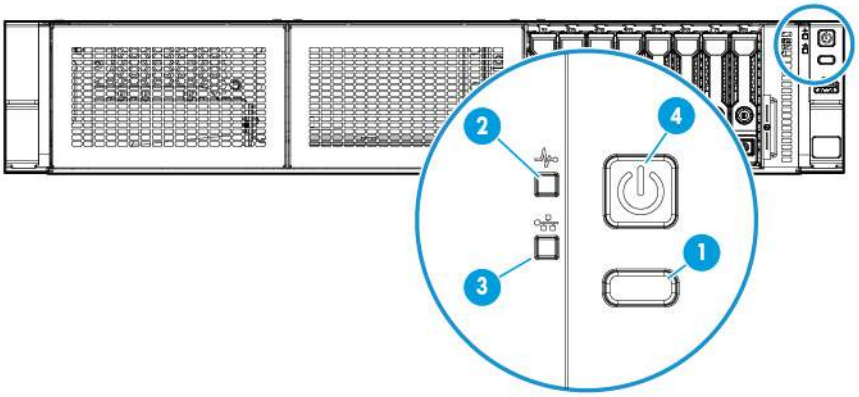
- Front panel LEDs and buttons in an LFF chassis with quick-release latch rack ears



- Front panel LEDs and buttons in an SFF chassis with thumbscrew rack ears



- Front panel LEDs and buttons in an SFF chassis with quick-release latch rack ears



Item	Description	Status
1	UID button/LED*	Solid blue = Activated Flashing blue: • 1 Hz/cycle per sec = Remote management or firmware upgrade in progress • 4 Hz/cycle per sec = iLO manual reboot sequence initiated • 8 Hz/cycle per sec = iLO manual reboot sequence in progress Off = Deactivated
2	Health LED*	Solid green = Normal Flashing green (1 Hz/cycle per sec) = iLO is rebooting Flashing amber = System degraded Flashing red (1 Hz/cycle per sec) = System critical**
3	NIC status LED*	Solid green = Link to network Flashing green (1 Hz/cycle per sec) = Network active Off = No network activity
4	Power On/Standby button and system power LED*	Solid green = System on Flashing green (1 Hz/cycle per sec) = Performing power on sequence Solid amber = System in standby Off = No power present†

* When all four LEDs described in this table flash simultaneously, a power fault has occurred. For more information, see "Power fault LEDs (on page 10)."

** If the health LED indicates a degraded or critical state, review the system IML or use iLO to review the system health status.

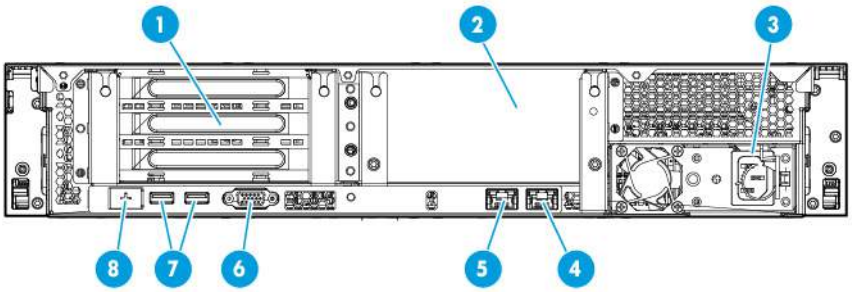
† Facility power is not present, power cord is not attached, no power supplies are installed, power supply failure has occurred, or the front I/O cable is disconnected.

Power fault LEDs

The following table provides a list of power fault LEDs, and the subsystems that are affected. Not all power faults are used by all servers.

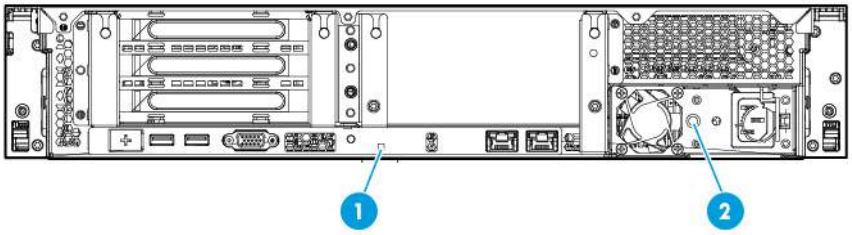
Subsystem	LED behavior
System board	1 flash
Processor	2 flashes
Memory	3 flashes
Riser board PCIe slots	4 flashes
FlexibleLOM	5 flashes
Removable HP Flexible Smart Array controller/Smart SAS HBA controller	6 flashes
System board PCIe slots	7 flashes
Power backplane or storage backplane	8 flashes
Power supply	9 flashes

Rear panel components



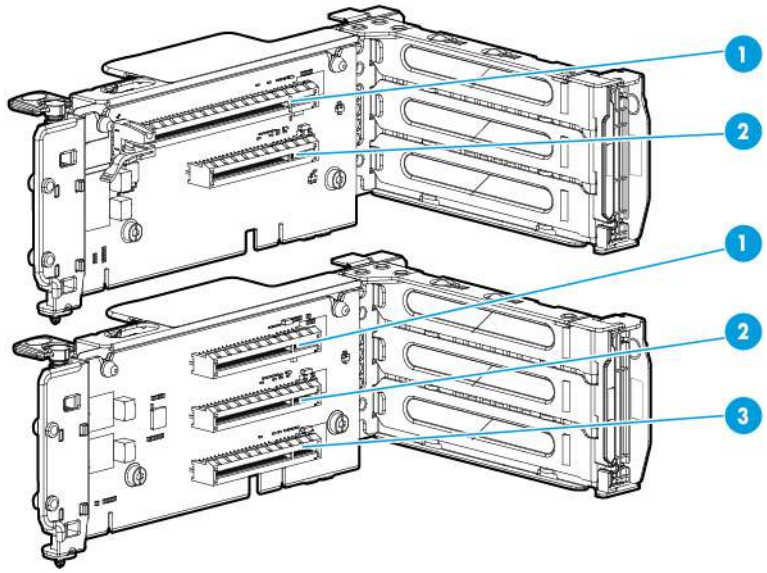
Item	Description
1	PCIe3 slots 1-3 (primary, associated with processor 1)
2	PCIe3 slots 1-3 (secondary, associated with processor 2)
3	Non-hot plug power supply
4	NIC connector 2
5	NIC 1/shared iLO connector
6	Video connector
7	USB 3.0 connectors
8	Dedicated iLO connector (optional)

Rear panel LEDs



Item	Description	Status
1	UID LED	Solid blue = Activated Flashing blue: • 1 Hz/cycle per sec = Remote management or firmware upgrade in progress • 4 Hz/cycle per sec = iLO manual reboot sequence initiated • 8 Hz/cycle per sec = iLO manual reboot sequence in progress Off = Deactivated
2	Power supply LED	Solid green = System on Off = No power present

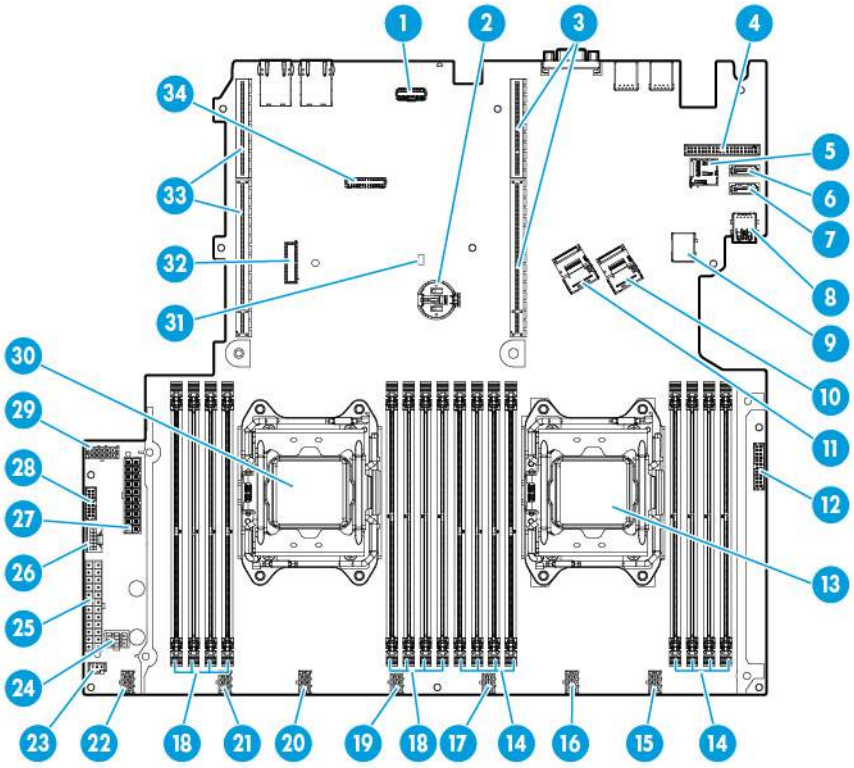
PCIe riser board slot definitions



Slot	2-slot PCIe3 riser[1, 2]	3-slot PCIe3 riser[1, 2]
Slot 1 = Full-length, full-height	PCIe3 x16 (16, 8, 4, 1)[3]	—
Slot 1 = Half-length, full-height	—	PCIe3 x8 (8, 4, 1)[3]
Slot 2 = Half-length, full-height	PCIe3 x8 (8, 4, 1)	PCIe3 x8 (8, 4, 1)
Slot 3 = Half-length, full-height	—	PCIe3 x8 (8, 4, 1)

[1] Both PCI riser cage assembly options can be installed in either the primary or the secondary PCIe riser location. For instructions on how to install these options, see "PCI riser cage assembly options (on page 86)." A second processor is required to support installation in the secondary PCIe riser location.
[2] The server ships with a primary PCI riser cage installed and a secondary PCI riser cage blank.
[3] Full-length expansion boards can only be installed in slot 1 of both riser boards.

System board components



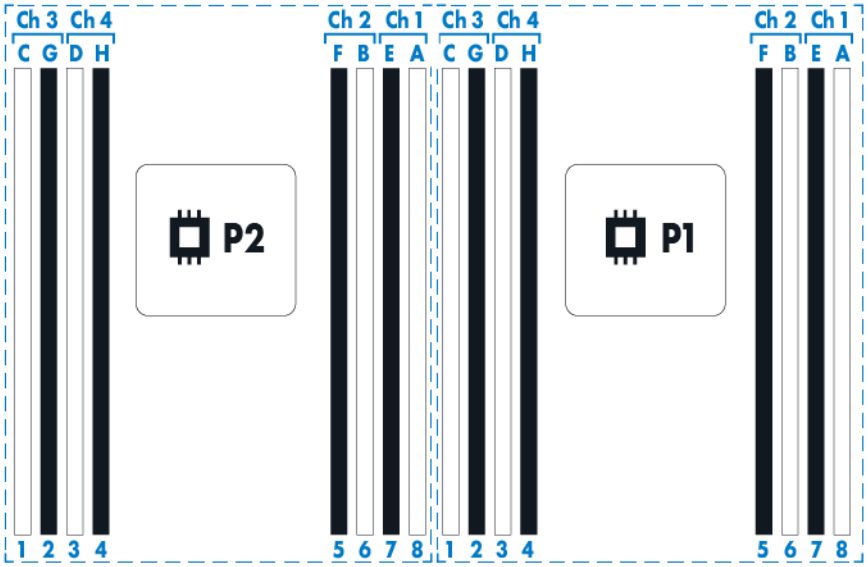
Item	Description
1	FlexibleLOM sideband signal connector
2	System battery
3	Primary PCIe riser board connectors*
4	Dedicated iLO module connector
5	microSD card slot
6	Reserved
7	SATA optical drive connector
8	Internal USB 3.0 connector (for USB flash devices)
9	Front USB 3.0 connector (for the USB 3.0 connector on the right quick-release latch rack ear)
10	Mini-SAS connector 1
11	Mini-SAS connector 2
12	Front I/O connector
13	Processor 1
14	Processor 1 DIMM slots
15	Fan connector 5
16	Fan connector 4
17	Reserved
18	Processor 2 DIMM slots
19	Fan connector 3
20	Fan connector 2

Item	Description
21	Fan connector 1
22	Reserved
23	12-bay LFF drive identification signal connector
24	GPU power connector
25	24-pin power supply connector
26	HP Smart Storage Battery connector
27	20-pin drive power connector
28	16-pin power supply sideband signal connector
29	10-pin RPS connector
30	Processor 2
31	NMI header
32	TPM connector
33	Secondary PCIe riser board connectors*
34	System maintenance switch

* For more information on the riser board slots supported by the onboard PCI riser connectors, see "PCIe riser board slot definitions (on page 12)."

DIMM slot locations

DIMM slots are numbered sequentially (1 through 8) for each processor. The supported AMP modes use the letter assignments for population guidelines.



System maintenance switch

Position	Default	Function
S1	Off	Off = iLO 4 security is enabled. On = iLO 4 security is disabled.
S2	Off	Off = System configuration can be changed. On = System configuration is locked.

Position	Default	Function
S3	Off	Reserved
S4	Off	Reserved
S5	Off	Off = Power-on password is enabled. On = Power-on password is disabled.
S6	Off	Off = No function On = ROM reads system configuration as invalid.
S7	—	Off = Set default boot mode to UEFI. On = Set default boot mode to legacy.
S8	—	Reserved
S9	—	Reserved
S10	—	Reserved
S11	—	Reserved
S12	—	Reserved

To access the redundant ROM, set S1, S5, and S6 to on.

When the system maintenance switch position 6 is set to the On position, the system is prepared to erase all system configuration settings from both CMOS and NVRAM.

CAUTION: Clearing CMOS and/or NVRAM deletes configuration information. Be sure to properly configure the server or data loss could occur.

IMPORTANT: Before using the S7 switch to change to Legacy BIOS Boot Mode, be sure the HP Dynamic Smart Array B140i Controller is disabled. Do not use the B140i controller when the server is in Legacy BIOS Boot Mode.

NMI functionality

An NMI crash dump creates a crash dump log before resetting a system which is not responding.

Crash dump log analysis is an essential part of diagnosing reliability problems, such as failures of operating systems, device drivers, and applications. Many crashes freeze a system, and the only available action for administrators is to restart the system. Resetting the system erases any information which could support problem analysis, but the NMI feature preserves that information by performing a memory dump before a system reset.

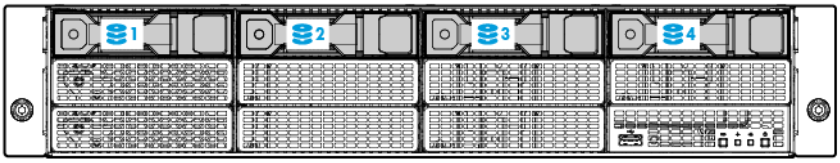
To force the system to invoke the NMI handler and generate a crash dump log, do one of the following:

- Use the iLO Virtual NMI feature.
- Short the NMI header ("System board components" on page 13).

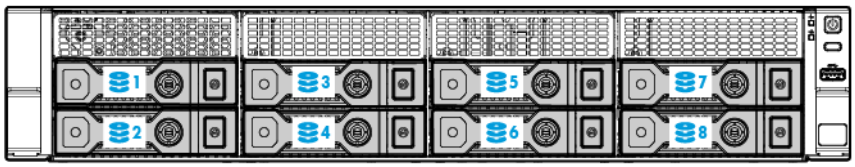
For more information, see the HP website (http://www.hp.com/support/NMI).

Drive numbering

- 4-bay LFF non-hot-plug drive model

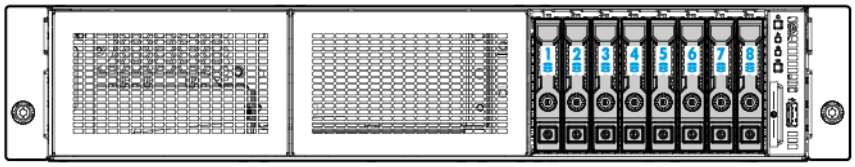


- 8-bay LFF hot-plug drive model



- 12-bay LFF hot-plug drive model

- 8-bay SFF hot-plug drive model

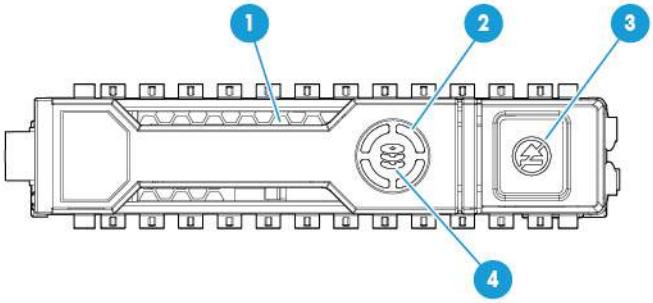


- 16-bay SFF hot-plug drive model

HP SmartDrive LED definitions

HP SmartDrives are the latest HP drive technology, and they are supported beginning with ProLiant Gen8 servers and server blades. The HP SmartDrive is not supported on earlier generation servers and server blades. Identify an HP SmartDrive by its carrier, shown in the following illustration.

When a drive is configured as a part of an array and connected to a powered-up controller, the drive LEDs indicate the condition of the drive.

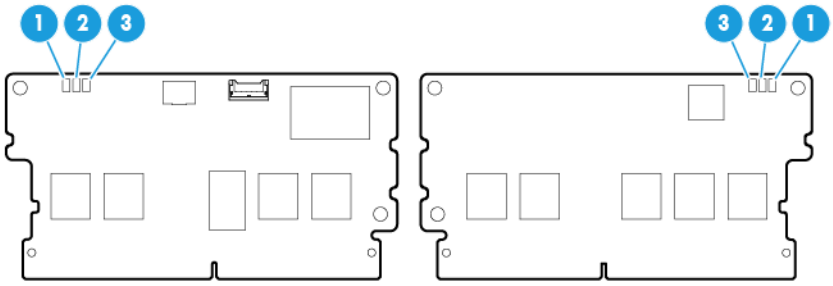


Item	LED	Status	Definition
1	Locate	Solid blue	The drive is being identified by a host application.
		Flashing blue	The drive carrier firmware is being updated or requires an update.
2	Activity ring	Rotating green	Drive activity
		Off	No drive activity
3	Do not remove	Solid white	Do not remove the drive. Removing the drive causes one or more of the logical drives to fail.
		Off	Removing the drive does not cause a logical drive to fail.
4	Drive status	Solid green	The drive is a member of one or more logical drives.
		Flashing green	The drive is rebuilding or performing a RAID migration, strip size migration, capacity expansion, or logical drive extension, or is erasing.
		Flashing amber/green	The drive is a member of one or more logical drives and predicts the drive will fail.
		Flashing amber	The drive is not configured and predicts the drive will fail.
		Solid amber	The drive has failed.
		Off	The drive is not configured by a RAID controller.

The blue Locate LED is behind the release lever and is visible when illuminated.

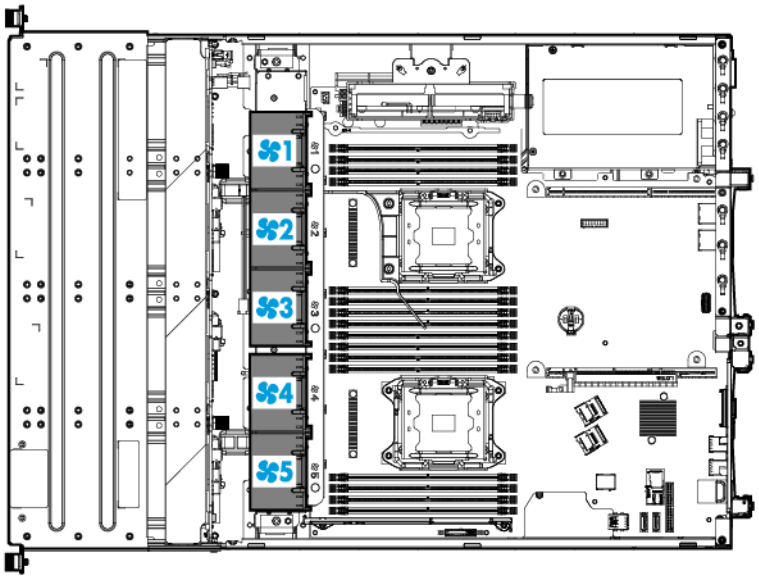
FBWC module LED definitions

The cache module has three single-color LEDs (one amber and two green). The LEDs are duplicated on the reverse side of the cache module to facilitate status viewing.



1 - Amber	2 - Green	3 - Green	Interpretation
Off	Off	Off	The FBWC module is not powered.
Off	Flashing once every 2 seconds	Flashing once every 2 seconds	The cache microcontroller is executing from within its boot loader and receiving new flash code from the host controller.
Off	Flashing once per second	Flashing once per second	The FBWC module is powering up, and the battery is charging.
Off	Off	Flashing once per second	The FBWC module is idle, and the battery is charging.
Off	Off	On	The FBWC module is idle, and the battery is charged.
Off	On	On	The FBWC module is idle, the battery is charged, and the cache contains data that has not yet been written to the drives.
Off	Flashing once per second	Off	A backup of the DDR content on the FBWC module is in progress.
Off	On	Off	The current backup is complete with no errors.
Flashing once per second	Flashing once per second	Off	The current backup failed, and data has been lost.
Flashing once per second	Flashing once per second	On	A power error occurred during the previous or current boot. Data may be corrupt.
Flashing once per second	On	Off	An overtemperature condition exists.
Flashing twice per second	Flashing twice per second	Off	The battery is not connected to the system board.
Flashing twice per second	Flashing twice per second	On	The battery has been charging for 10 minutes, but has not reached sufficient charge to perform a full backup.
On	On	Off	The current backup is complete, but power fluctuations occurred during the backup.
On	On	On	The FBWC module microcontroller has failed.

Fan locations



Operations

Power up the server

To power up the server, press the Power On/Standby button.

Power down the server

Before powering down the server for any upgrade or maintenance procedures, perform a backup of critical server data and programs.

IMPORTANT: When the server is in standby mode, auxiliary power is still being provided to the system.

To power down the server, use one of the following methods:

- Press and release the Power On/Standby button.

  This method initiates a controlled shutdown of applications and the OS before the server enters standby mode.
- Press and hold the Power On/Standby button for more than 4 seconds to force the server to enter standby mode.

  This method forces the server to enter standby mode without properly exiting applications and the OS. If an application stops responding, you can use this method to force a shutdown.
- Use a virtual power button selection through iLO 4.

  This method initiates a controlled remote shutdown of applications and the OS before the server enters standby mode.

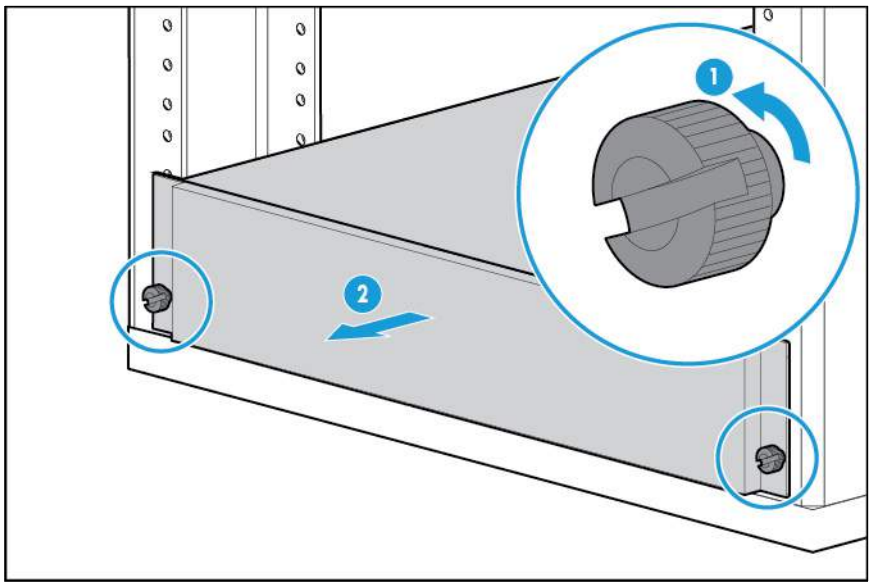
Before proceeding, verify the server is in standby mode by observing that the system power LED is amber.

Extend the server from the rack

WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.

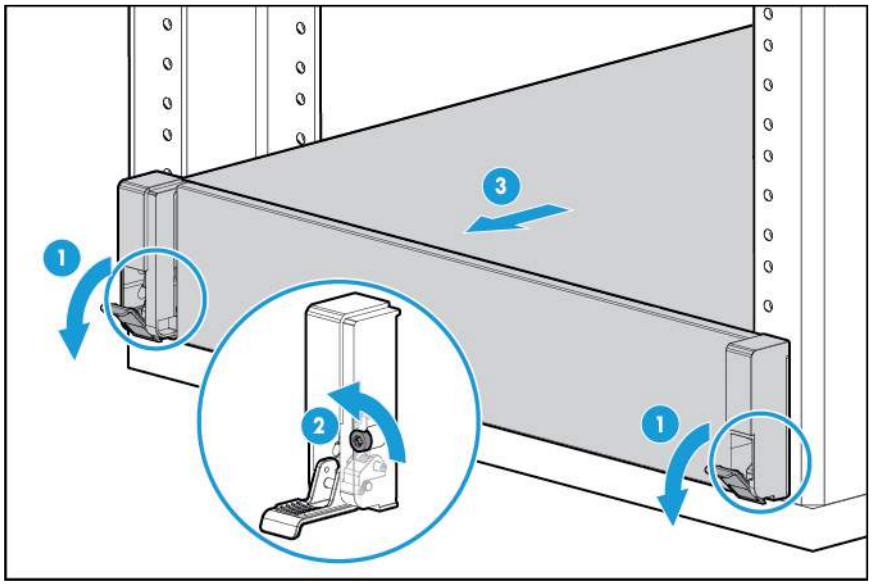
1. Do one of the following:

- In a server that uses thumbscrew rack ears, loosen the captive thumbscrews that secure the server faceplate to the front of the enclosure, and then slide the server out of the enclosure.

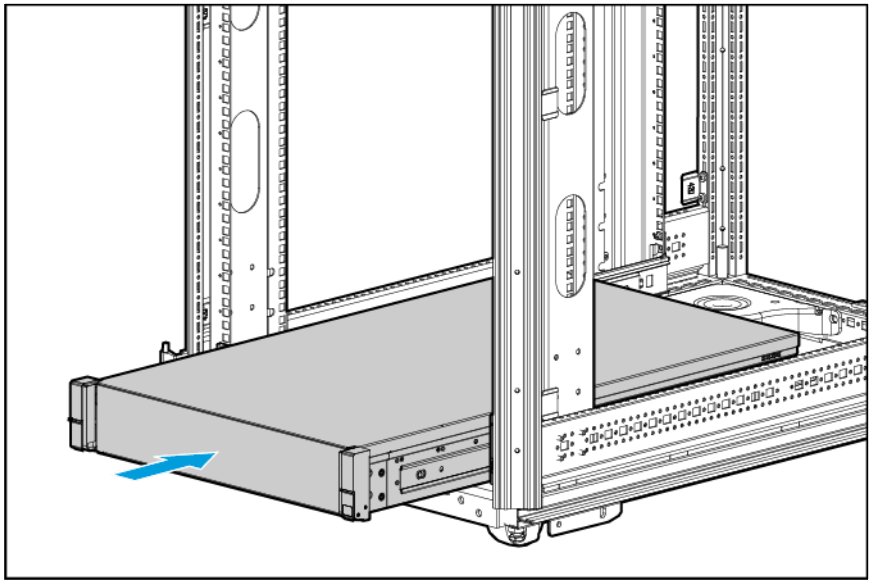


- In a server that uses quick-release latch rack ears:
  i. Open the latches on both sides of the server.
  ii. If necessary, use a T-25 Torx screwdriver to loosen the shipping screws.

a. Slide the server out of the enclosure.



2. After performing the installation or maintenance procedure, slide the server back into the enclosure, and then press the server firmly into the enclosure to secure it in place.



3. Do one of the following:
   - In a server that uses thumbscrew rack ears, tighten the captive thumbscrews.
   - In a server that uses quick-release latch rack ears, if necessary, tighten the shipping screws.

Remove the server from the rack

⚠ **WARNING:** This server is very heavy. To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational health and safety requirements and guidelines for manual material handling.
- Get help to lift and stabilize the product during installation or removal, especially when the product is not fastened to the rails. HP recommends that a minimum of two people are required for all rack server installations. A third person may be required to help align the server if the server is installed higher than chest level.
- Use caution when installing the server in or removing the server from the rack; it is unstable when not fastened to the rails.

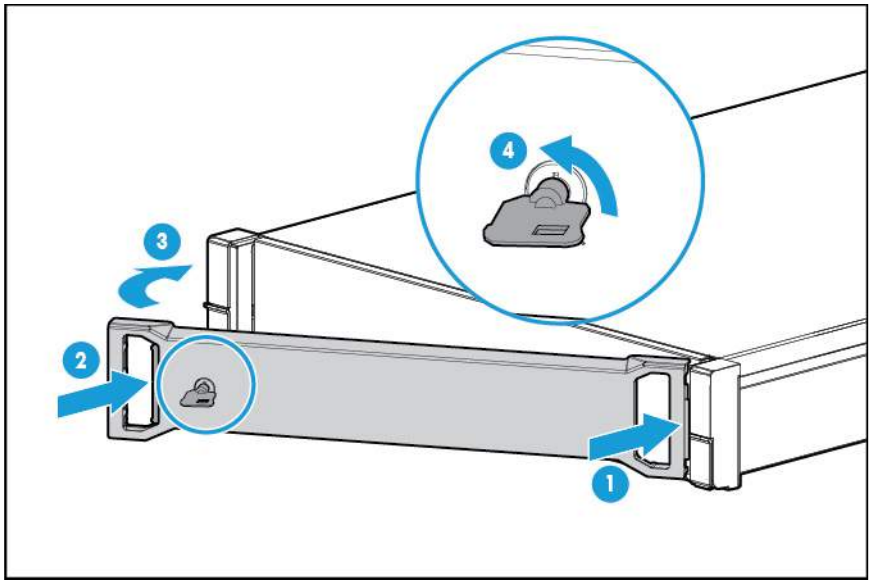
To remove the server from an HP, Compaq-branded, Telco, or a third-party enclosure:

1. Power down the server (on page 20).
2. Extend the server on the rack rails until the server rail-release latches engage.
3. Disconnect all peripheral cables from the server.
4. Disconnect each power cord from the server.
5. Remove the server from the rack.

   For instructions on how to extend or remove the server from the rack, see the documentation that ships with the rack rail system.
6. Place the server on a sturdy, level surface.

Remove the security bezel (optional)

To access the front panel components, unlock and then remove the security bezel. The security bezel is only supported in servers that are using the quick-release latch rack ears.

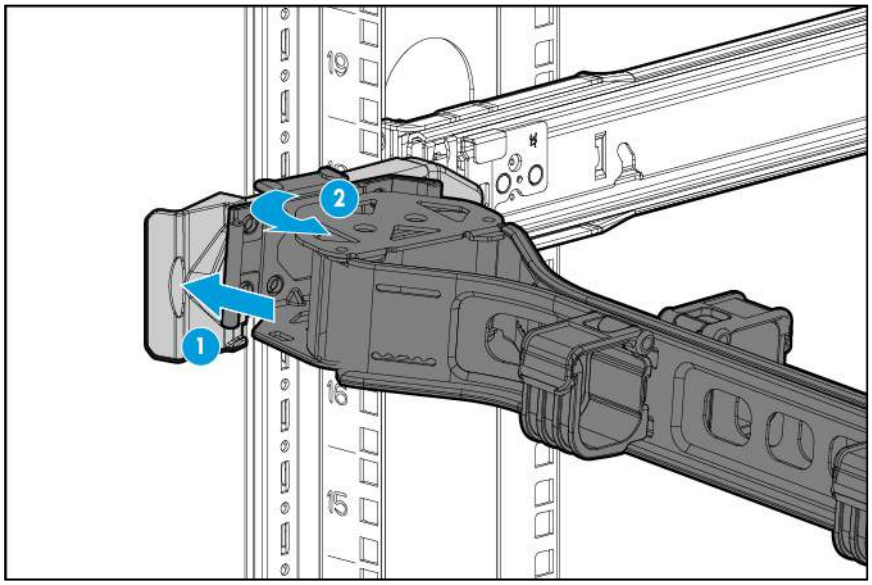


Access the product rear panel

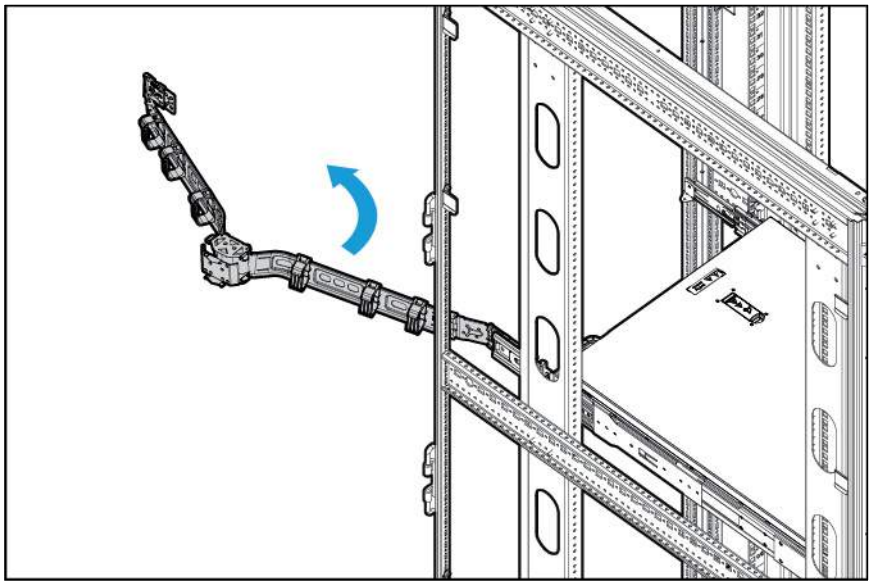
Opening the cable management arm

To access the server rear panel:

1. Release the cable management arm.



2. Open the cable management arm. The cable management arm can be right-mounted or left-mounted.



Remove the access panel

WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

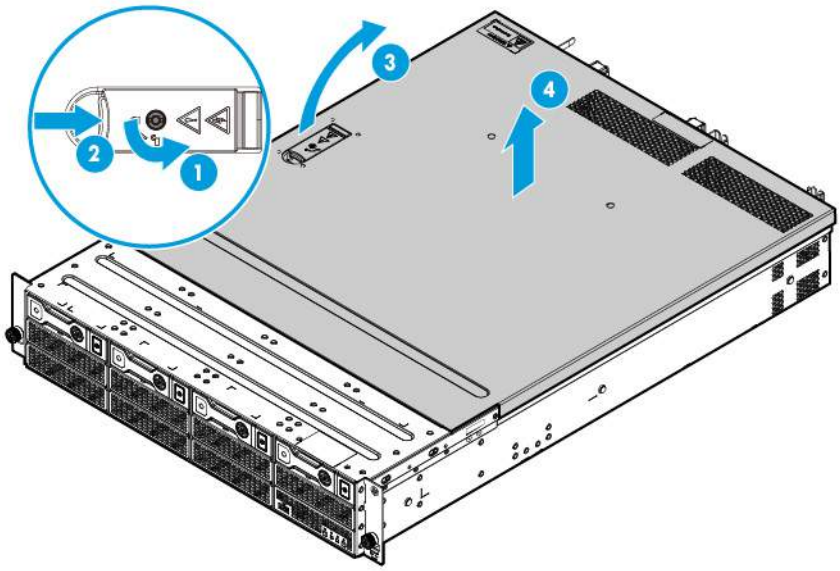
CAUTION: Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.

To remove the component:

1. Power down the server (on page 20).
2. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
3. If the locking latch is locked, use a T-15 Torx screwdriver to unlock the latch.
4. Open the locking latch.

   The access panel slides back, releasing it from the chassis.

5. Lift and remove the access panel.



Turn the access panel over to locate the HP ProLiant DL180 Gen9 Server hood label. This label provides convenient access to component identification, LED status indicators, and system maintenance switch settings information.

Install the access panel

1. Place the access panel on top of the server with the access panel locking latch open. Allow the panel to extend past the rear of the server by approximately 1.25 cm (0.5 inch).
2. Close the access panel locking latch. The access panel slides to a closed position.
3. Use a T-15 Torx screwdriver to tighten the access panel locking latch screw.

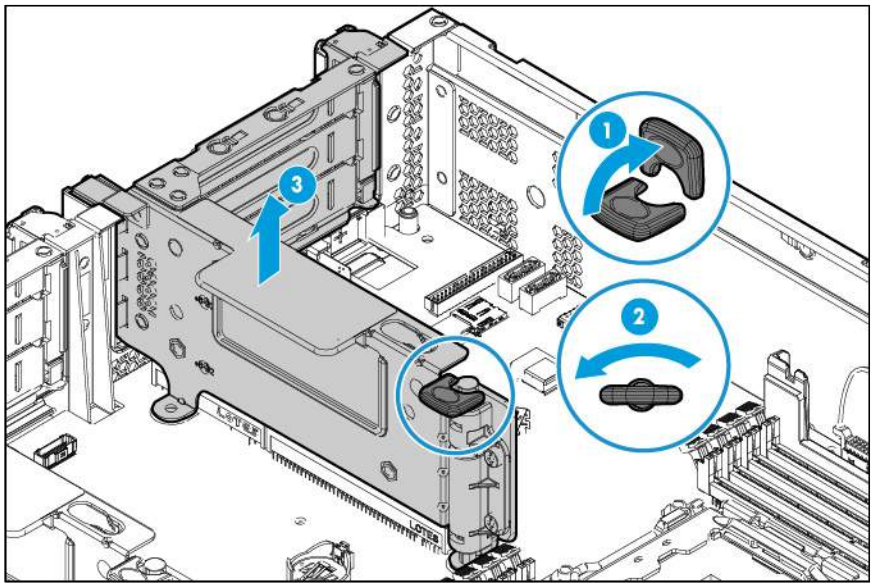
Remove the PCI riser cages

△ **CAUTION:** To prevent damage to the server or expansion boards, power down the server, and disconnect all power cords before removing or installing the PCI riser cage.

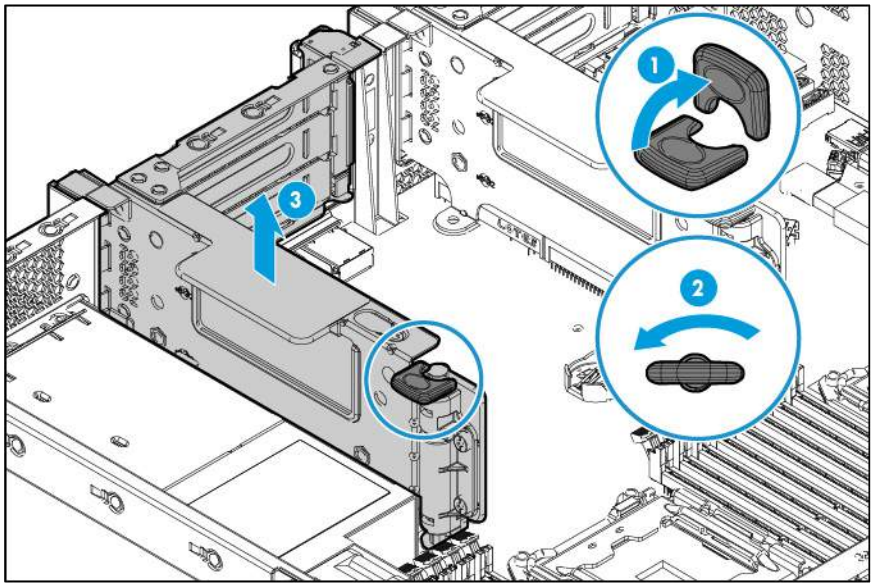
To remove the component:

1. Power down the server (on page 20).
2. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
3. Remove the access panel (on page 24).
4. Disconnect all cables connected to existing expansion boards.
5. Lift the release tab, and then rotate it 180° counterclockwise.
6. Lift the PCI riser cage to unseat the PCI riser board.

- Primary PCI riser cage



- Secondary PCI riser cage



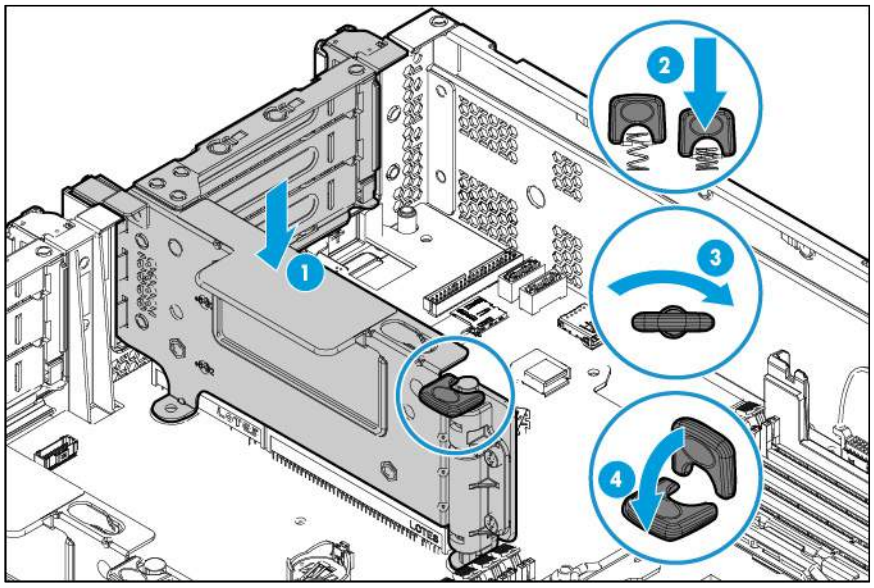
Install the PCI riser cages

△ **CAUTION:** To prevent damage to the server or expansion boards, power down the server, and disconnect all power cords before removing or installing the PCI riser cage.

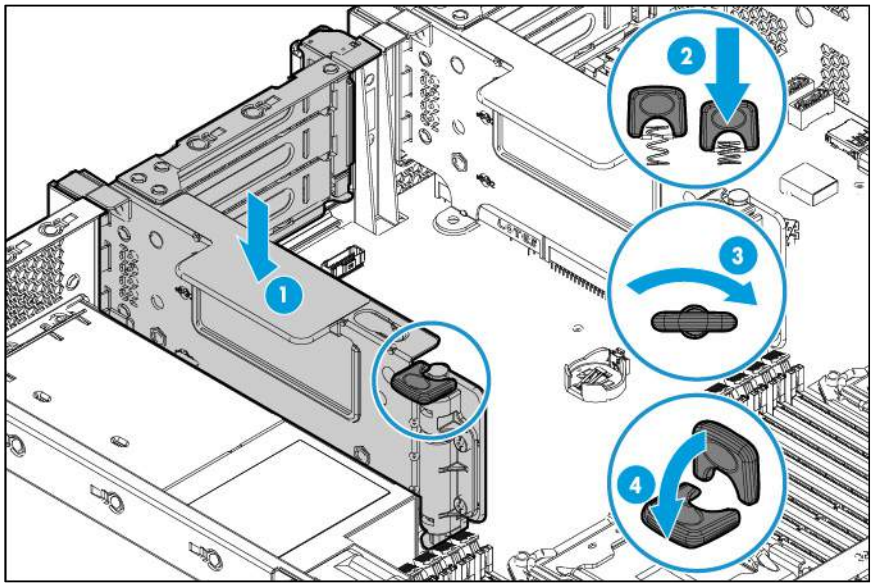
To install the component:

1. Align the riser board with the corresponding connectors on the system board, and then press down the PCI riser cage.
2. Push down the release tab, and then rotate it 180° clockwise.

- Primary PCI riser cage



- Secondary PCI riser cage



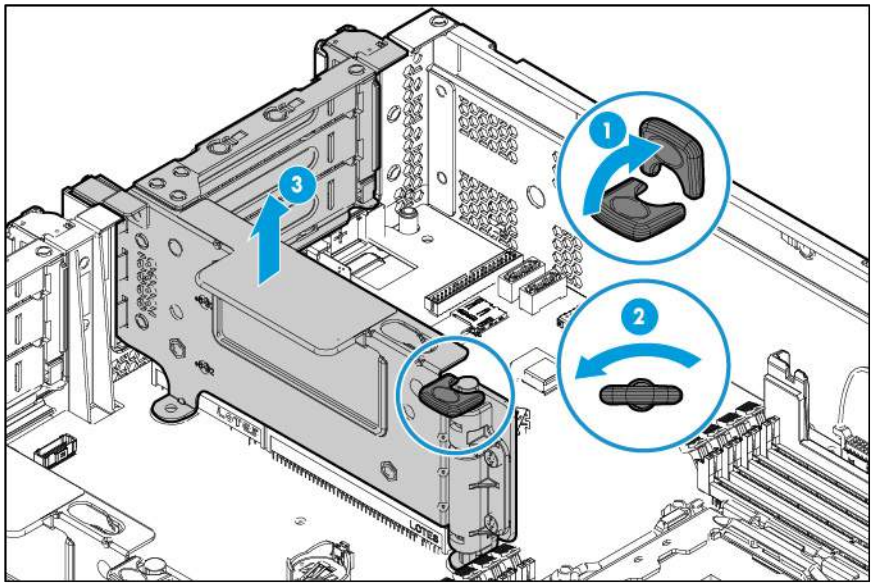
3. If necessary, connect all required internal cabling to existing expansion boards. For more information on these cabling requirements, see the documentation that ships with the option.
4. Install the access panel (on page 25).
5. Do one of the following:
   - Slide the server into the rack.
   - Install the server into the rack ("Installing the server into the rack" on page 36).
6. Power up the server (on page 20).

Remove the air baffle

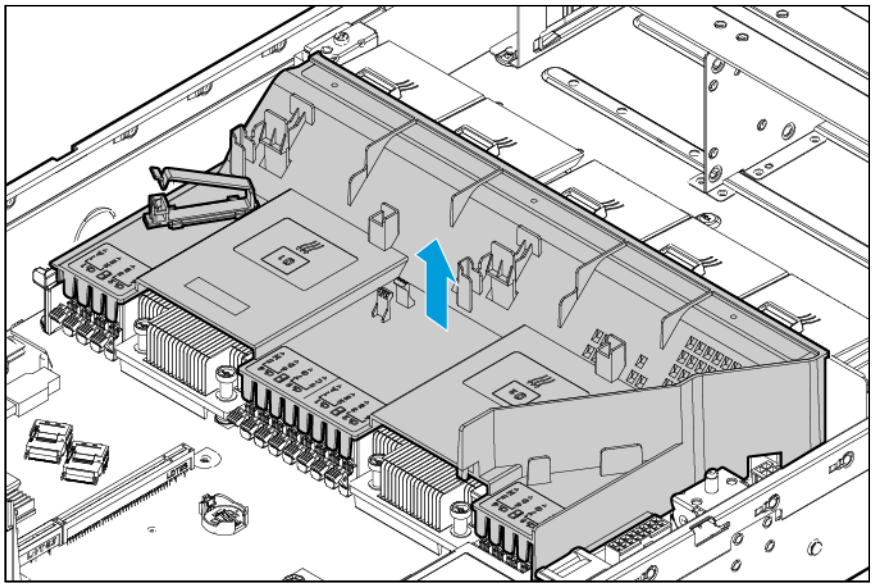
CAUTION: For proper cooling, do not operate the server without the access panel, baffles, expansion slot covers, or blanks installed. If the server supports hot-plug components, minimize the amount of time the access panel is open.

To remove the component:

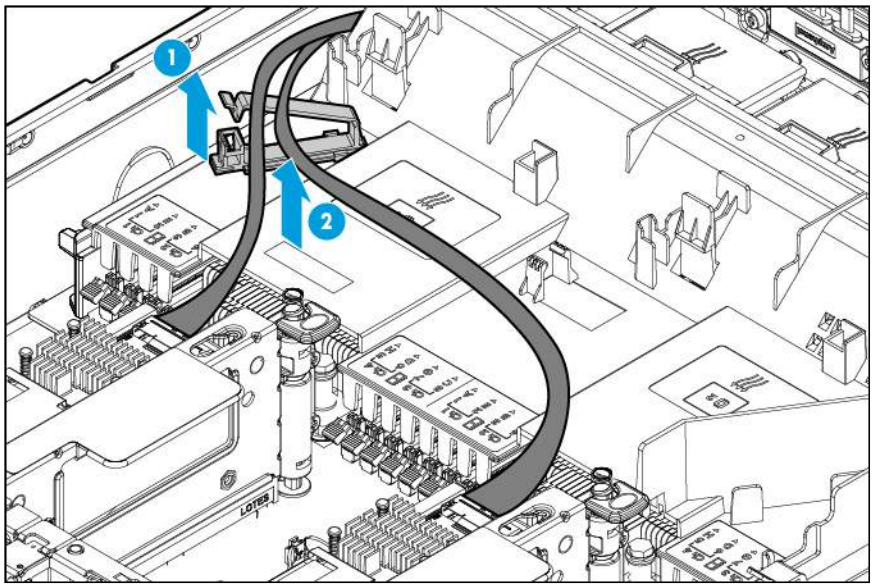
1. Power down the server (on page 20).
2. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
3. Remove the access panel (on page 24).
4. If a PCI riser cage has a full-length expansion board installed on it, do the following:
   a. Disconnect all cables connected to existing expansion boards.
   b. Remove the PCI riser cage.



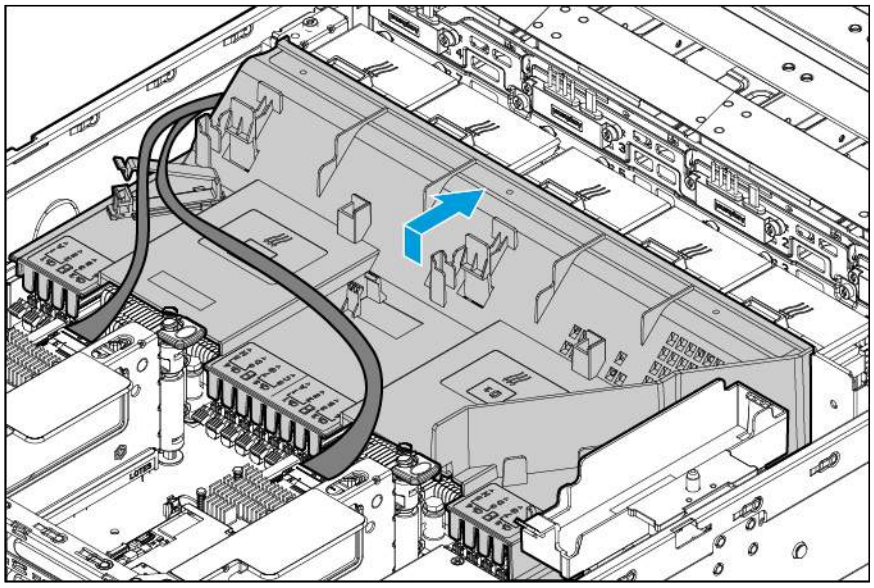
c. Remove the air baffle in an upward direction as shown in the following image.



5. If a PCI riser cage has a half-length expansion board installed on it, do the following:
   a. Release the expansion board cables from the air baffle cable clip.



b. Remove the air baffle in the direction shown in the following image.

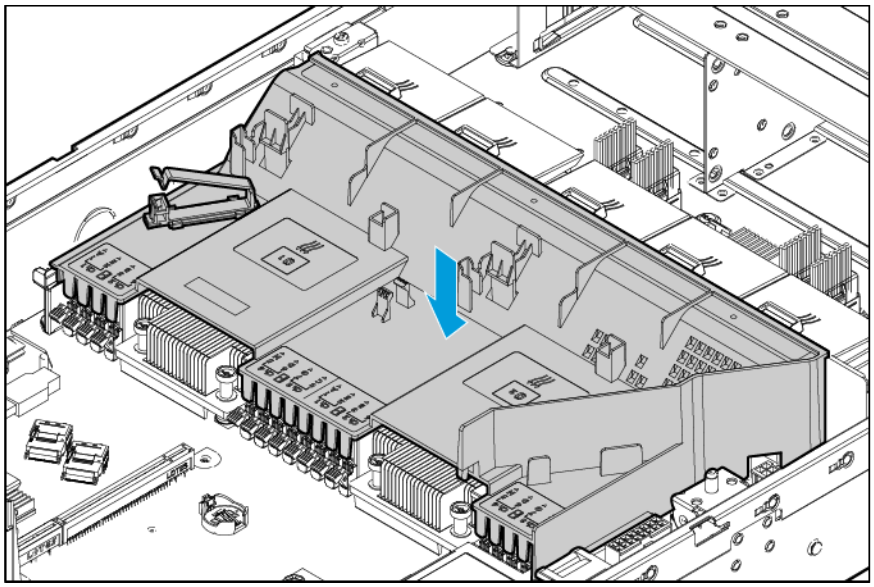


Install the air baffle

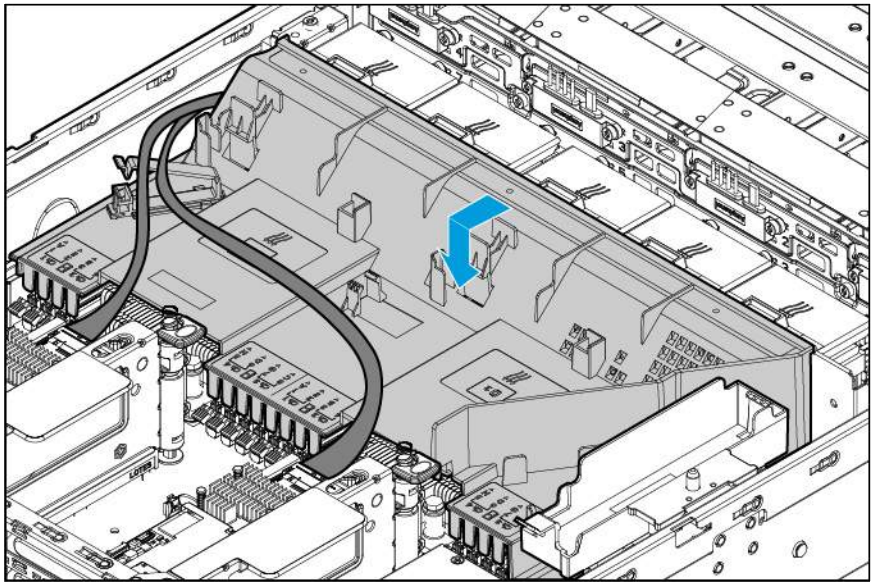
CAUTION: For proper cooling, do not operate the server without the access panel, baffles, expansion slot covers, or blanks installed. If the server supports hot-plug components, minimize the amount of time the access panel is open.

To install the component:

1. Do one of the following:
   - If there is no full-length expansion board or a cabled half-length expansion board installed in a PCI riser cage, install the air baffle in the direction shown in the following image.



- If there is a cabled half-length expansion board installed in a PCI riser cage, install the air baffle in the direction shown in the following image.



2. If necessary, secure the half-length expansion board cables in the air baffle cable clip.
3. Install the access panel (on page 25).
4. Do one of the following:
   - Slide the server into the rack.
   - Install the server into the rack ("Installing the server into the rack" on page 36).
5. Power up the server (on page 20).

Setup

Optional installation services

Delivered by experienced, certified engineers, HP Care Pack services help you keep your servers up and running with support packages tailored specifically for HP ProLiant systems. HP Care Packs let you integrate both hardware and software support into a single package. A number of service level options are available to meet your needs.

HP Care Pack Services offer upgraded service levels to expand your standard product warranty with easy-to-buy, easy-to-use support packages that help you make the most of your server investments. Some of the Care Pack services are:

- Hardware support
  - 6-Hour Call-to-Repair
  - 4-Hour 24x7 Same Day
  - 4-Hour Same Business Day
- Software support
  - Microsoft®
  - Linux
  - HP ProLiant Essentials (HP SIM and RDP)
  - VMware
- Integrated hardware and software support
  - Critical Service
  - Proactive 24
  - Support Plus
  - Support Plus 24
- Startup and implementation services for both hardware and software

For more information on HP Care Pack Services, see the HP website (http://www.hp.com/services/carepack).

Optimum environment

When installing the server in a rack, select a location that meets the environmental standards described in this section.

Space and airflow requirements

To allow for servicing and adequate airflow, observe the following space and airflow requirements when deciding where to install a rack:

- Leave a minimum clearance of 63.5 cm (25 in) in front of the rack.
- Leave a minimum clearance of 76.2 cm (30 in) behind the rack.
- Leave a minimum clearance of 121.9 cm (48 in) from the back of the rack to the back of another rack or row of racks.

HP servers draw in cool air through the front door and expel warm air through the rear door. Therefore, the front and rear rack doors must be adequately ventilated to allow ambient room air to enter the cabinet, and the rear door must be adequately ventilated to allow the warm air to escape from the cabinet.

CAUTION: To prevent improper cooling and damage to the equipment, do not block the ventilation openings.

When vertical space in the rack is not filled by a server or rack component, the gaps between the components cause changes in airflow through the rack and across the servers. Cover all gaps with blanking panels to maintain proper airflow.

CAUTION: Always use blanking panels to fill empty vertical spaces in the rack. This arrangement ensures proper airflow. Using a rack without blanking panels results in improper cooling that can lead to thermal damage.

The 9000 and 10000 Series Racks provide proper server cooling from flow-through perforations in the front and rear doors that provide 64 percent open area for ventilation.

CAUTION: When using a Compaq branded 7000 series rack, install the high airflow rack door insert (PN 327281-B21 for 42U rack, PN 157847-B21 for 22U rack) to provide proper front-to-back airflow and cooling.

CAUTION: If a third-party rack is used, observe the following additional requirements to ensure adequate airflow and to prevent damage to the equipment:

- Front and rear doors—If the 42U rack includes closing front and rear doors, you must allow 5,350 sq cm (830 sq in) of holes evenly distributed from top to bottom to permit adequate airflow (equivalent to the required 64 percent open area for ventilation).
- Side—The clearance between the installed rack component and the side panels of the rack must be a minimum of 7 cm (2.75 in).

IMPORTANT: The HP ProLiant DL180 Gen9 Server cable management arm is not supported on Compaq branded 7000 series racks.

Temperature requirements

To ensure continued safe and reliable equipment operation, install or position the system in a well-ventilated, climate-controlled environment.

The maximum recommended ambient operating temperature (TMRA) for most server products is 35°C (95°F). The temperature in the room where the rack is located must not exceed 35°C (95°F).

CAUTION: To reduce the risk of damage to the equipment when installing third-party options:

- Do not permit optional equipment to impede airflow around the server or to increase the internal rack temperature beyond the maximum allowable limits.
- Do not exceed the manufacturer's TMRA.

Power requirements

Installation of this equipment must comply with local and regional electrical regulations governing the installation of information technology equipment by licensed electricians. This equipment is designed to operate in installations covered by NFPA 70, 1999 Edition (National Electric Code) and NFPA-75, 1992 (code for Protection of Electronic Computer/Data Processing Equipment). For electrical power ratings on options, refer to the product rating label or the user documentation supplied with that option.

⚠ **WARNING:** To reduce the risk of personal injury, fire, or damage to the equipment, do not overload the AC supply branch circuit that provides power to the rack. Consult the electrical authority having jurisdiction over wiring and installation requirements of your facility.

△ **CAUTION:** Protect the server from power fluctuations and temporary interruptions with a regulating uninterruptible power supply. This device protects the hardware from damage caused by power surges and voltage spikes and keeps the system in operation during a power failure.

When installing more than one server, you might need to use additional power distribution devices to safely provide power to all devices. Observe the following guidelines:

- Balance the server power load between available AC supply branch circuits.
- Do not allow the overall system AC current load to exceed 80% of the branch circuit AC current rating.
- Do not use common power outlet strips for this equipment.
- Provide a separate electrical circuit for the server.

For more information on the hot-plug power supply and calculators to determine server power consumption in various system configurations, see the HP Power Advisor website (http://www.hp.com/go/hppoweradvisor).

Electrical grounding requirements

The server must be grounded properly for proper operation and safety. In the United States, you must install the equipment in accordance with NFPA 70, 1999 Edition (National Electric Code), Article 250, as well as any local and regional building codes. In Canada, you must install the equipment in accordance with Canadian Standards Association, CSA C22.1, Canadian Electrical Code. In all other countries, you must install the equipment in accordance with any regional or national electrical wiring codes, such as the International Electrotechnical Commission (IEC) Code 364, parts 1 through 7. Furthermore, you must be sure that all power distribution devices used in the installation, such as branch wiring and receptacles, are listed or certified grounding-type devices.

Because of the high ground-leakage currents associated with multiple servers connected to the same power source, HP recommends the use of a PDU that is either permanently wired to the building's branch circuit or includes a nondetachable cord that is wired to an industrial-style plug. NEMA locking-style plugs or those complying with IEC 60309 are considered suitable for this purpose. Using common power outlet strips for the server is not recommended.

Server warnings and cautions

⚠ **WARNING:** This server is very heavy. To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational health and safety requirements and guidelines for manual material handling.
- Get help to lift and stabilize the product during installation or removal, especially when the product is not fastened to the rails. HP recommends that a minimum of two people are required for all rack server installations. A third person may be required to help align the server if the server is installed higher than chest level.
- Use caution when installing the server in or removing the server from the rack; it is unstable when not fastened to the rails.

⚠ **WARNING:** To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

⚠ **WARNING:** To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The front panel Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

⚠ **CAUTION:** Protect the server from power fluctuations and temporary interruptions with a regulating uninterruptible power supply. This device protects the hardware from damage caused by power surges and voltage spikes and keeps the system in operation during a power failure.

⚠ **CAUTION:** Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.

Rack warnings

⚠ **WARNING:** To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
- The full weight of the rack rests on the leveling jacks.
- The stabilizing feet are attached to the rack if it is a single-rack installation.
- The racks are coupled together in multiple-rack installations.
- Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.

⚠ **WARNING:** To reduce the risk of personal injury or equipment damage when unloading a rack:

- At least two people are needed to safely unload the rack from the pallet. An empty 42U rack can weigh as much as 115 kg (253 lb), can stand more than 2.1 m (7 ft) tall, and might become unstable when being moved on its casters.
- Never stand in front of the rack when it is rolling down the ramp from the pallet. Always handle the rack from both sides.

⚠ **WARNING:** To reduce the risk of personal injury or damage to the equipment, adequately stabilize the rack before extending a component outside the rack. Extend only one component at a time. A rack may become unstable if more than one component is extended.

⚠ **WARNING:** When installing a server in a telco rack, be sure that the rack frame is adequately secured at the top and bottom to the building structure.

Identifying the contents of the server shipping carton

Unpack the server shipping carton and locate the materials and documentation necessary for installing the server. All the rack mounting hardware necessary for installing the server into the rack is included with the rack or the server.

The contents of the server shipping carton include:

- Server
- Power cord
- Rack rail hook-and-loop strap
- Rack mounting hardware kit
- Printed setup documentation

In addition to the supplied items, you might need:

- T-25 Torx screwdriver (to loosen the shipping screws located inside the server quick-release latch rack ears)
- T-10/T-15 Torx screwdriver
- Flathead screwdriver (to remove the knockout on the dedicated iLO connector opening)
- Hardware options

Installing hardware options

Install any hardware options before initializing the server. For options installation information, refer to the option documentation. For server-specific information, refer to "Hardware options installation (on page 42)."

Installing the server into the rack

To install the server into a rack with square, round, or threaded holes, refer to the instructions that ship with the rack hardware kit.

If you are installing the server into a telco rack, order the appropriate option kit at the RackSolutions.com website (http://www.racksolutions.com/hp-dl180-g9-rails.html). Follow the server-specific instructions on the website to install the rack brackets.

WARNING: This server is very heavy. To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational health and safety requirements and guidelines for manual material handling.
- Get help to lift and stabilize the product during installation or removal, especially when the product is not fastened to the rails. HP recommends that a minimum of two people are required for all rack server installations. A third person may be required to help align the server if the server is installed higher than chest level.
- Use caution when installing the server in or removing the server from the rack; it is unstable when not fastened to the rails.

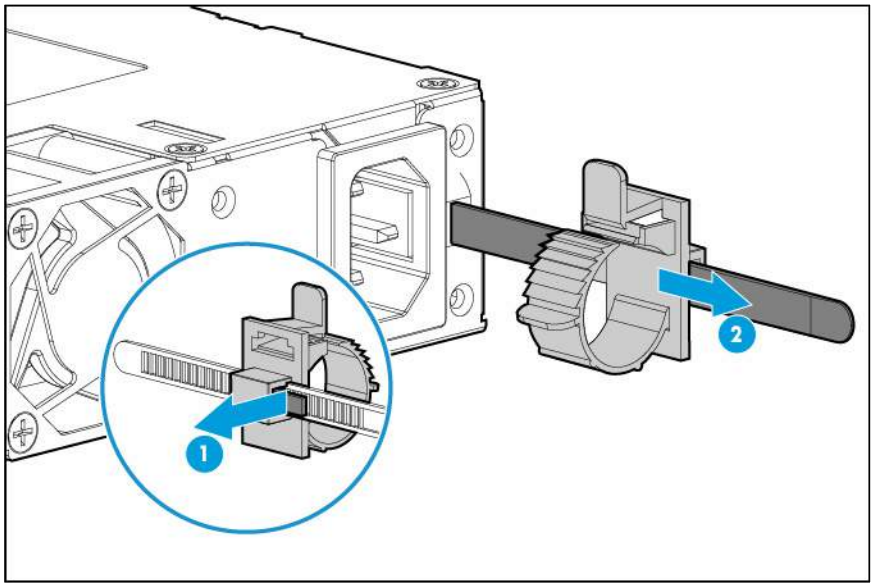
CAUTION: Always plan the rack installation so that the heaviest item is on the bottom of the rack. Install the heaviest item first, and continue to populate the rack from the bottom to the top.

To install the server in an HP, Compaq-branded, Telco, or a third-party rack:

1. Install the server and cable management arm option into the rack. See the documentation that ships with the Easy Install Rail Kit.
2. Connect peripheral devices to the server. For information on identifying connectors, see "Rear panel components (on page 11)."

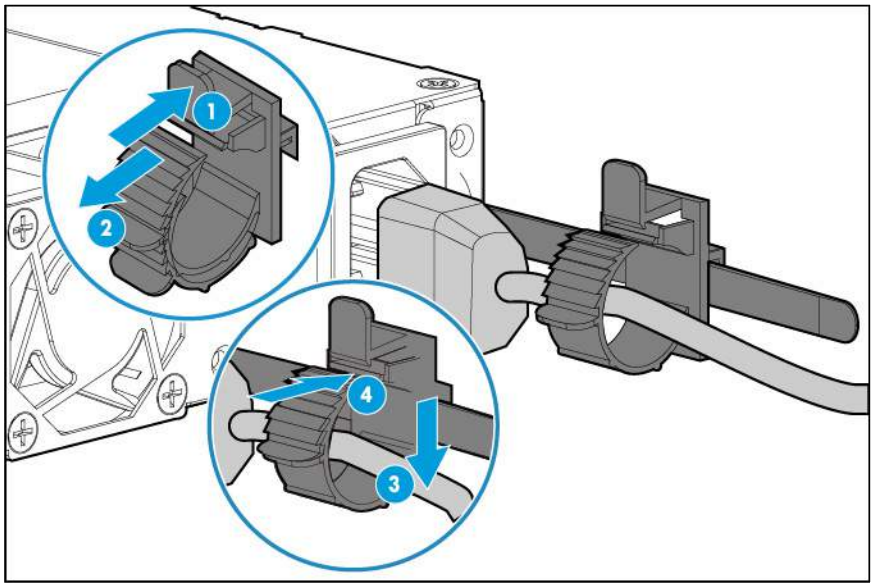
   WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into RJ-45 connectors.

3. To prevent the accidental disconnection of the power cord when sliding the enclosure into and from the rack, secure the power cord through the strain relief clip:
   a. If the clip is positioned too near the power cord that it blocks the power cord plug connection, slide the clip backward.

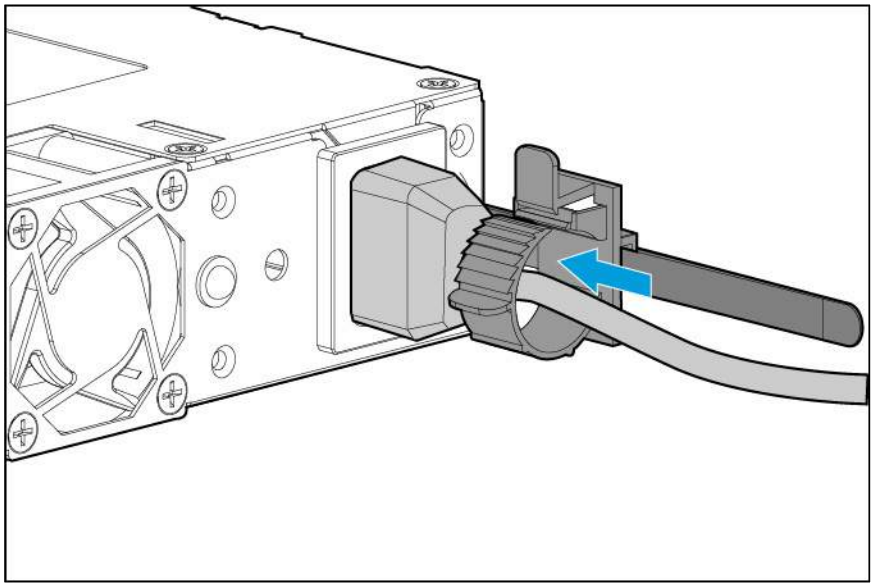


   b. Connect the power cord to the server.
   c. Press the top part of the clip, and then pull the clip open.

d. Position the power cord inside the clip, and then close the clip.



e. Slide the clip forward until it is flushed against the edge of the power cord plug.



4. Employ best practices to route and manage the power cords and other cables in the server rear panel.

IMPORTANT: When using cable management arm components, be sure to leave enough slack in each of the cables to prevent damage to the cables when the server is extended from the rack.

5. Use the hook-and-loop strap included in the server shipping carton to secure the power cords and the other rear panel cables to the rack rail. For detailed instructions, see "Installing the rack rail hook-and-loop strap (on page 39)."
6. Connect the power cord to the power source.

WARNING: To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the server.

Installing the rack rail hook-and-loop strap

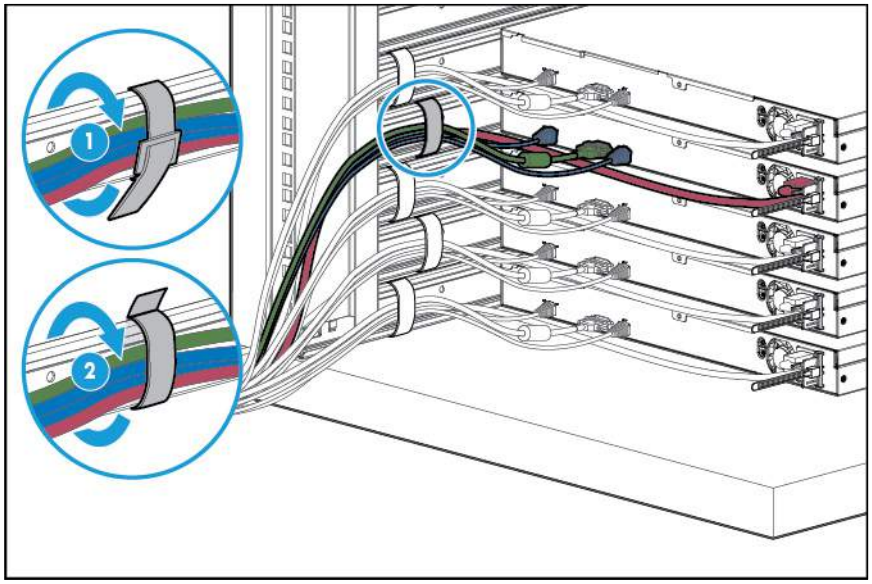
The rack rail hook-and-loop strap can be installed on either the left or right rack rail. HP recommends installing it on the left rack rail for better cable management.

To install the rack rail hook-and-loop strap:

1. Install the server into the rack ("Installing the server into the rack" on page 36).
2. Install the rack rail hook-and-loop strap:
   a. Hold the rear panel cables against the rack rail, and then wrap the strap around the rack rail.

CAUTION: To prevent thermal or mechanical obstruction on full-length servers installed in the rack, the extra length and buckle part of the strap must be facing the outside of the rack rail.

   b. Loop the end of the hook-and-loop strap through the buckle.



When multiple hook-and-loop straps are used in the same rack, stagger the strap location, so that the straps are adjacent to each other when viewed from top to bottom. This positioning will enable the rack rail to slide easily in and out of the rack.

Installing the operating system

This HP ProLiant server does not ship with provisioning media. Everything needed to manage and install the system software and firmware is preloaded on the server.

To operate properly, the server must have a supported operating system. For the latest information on operating system support, see the HP website (http://www.hp.com/go/supportos).

To install an operating system on the server, use one of the following methods:

- Intelligent Provisioning—iLO contains Intelligent Provisioning for embedded deployment, updating, and provisioning capabilities. Intelligent Provisioning can configure the server and install an operating system.

  To install an operating system on the server with Intelligent Provisioning (local or remote):

  a. Connect the Ethernet cable between the network connector on the server and a network jack.
  b. Press the Power On/Standby button.
  c. During server POST, press the **F10** key.
  d. Complete the initial **Preferences and Registration** portion of Intelligent Provisioning (on page 110).
  e. At the 1 Start screen, click the **Configure and Install** button.
  f. To finish the installation, follow the onscreen prompts. An Internet connection is required to update the firmware and systems software.

- Remote deployment installation—To deploy an operating system remotely, use Insight Control server deployment for an automated solution.

For additional system software and firmware updates, download the HP Service Pack for ProLiant from the HP website (http://www.hp.com/go/spp/download). Software and firmware must be updated before using the server for the first time, unless any installed software or components require an older version. For more information, see "Keeping the system current (on page 117)."

For more information on using these installation methods, see the HP website (http://www.hp.com/go/ilo).

Powering on and selecting boot options in UEFI Boot Mode

On servers operating in UEFI Boot Mode, the boot controller and boot order are set automatically.

1. Press the Power On/Standby button.
2. During the initial boot:
   - To modify the server configuration ROM default settings, press the **F9** key in the HP ProLiant POST screen to enter the UEFI System Utilities screen. By default, the System Utilities menus are in the English language.
   - If you do not need to modify the server configuration and are ready to install the system software, press the **F10** key to access Intelligent Provisioning.

For more information on automatic configuration, see the *HP UEFI System Utilities User Guide* on the HP website (http://www.hp.com/go/ProLiantUEFI/docs).

Registering the server

To experience quicker service and more efficient support, register the product at the HP Product Registration website (http://register.hp.com).

Hardware options installation

Introduction

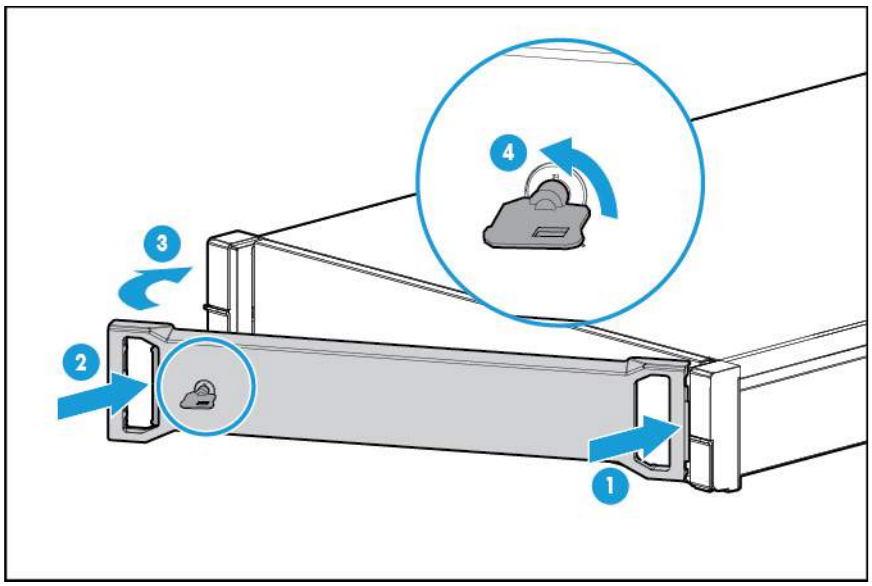
If more than one option is being installed, read the installation instructions for all the hardware options and identify similar steps to streamline the installation process.

⚠ **WARNING:** To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

⚠ **CAUTION:** To prevent damage to electrical components, properly ground the server before beginning any installation procedure. Improper grounding can cause electrostatic discharge.

Security bezel option

The security bezel helps prevent unauthorized physical access to the front panel components. Install the security bezel and then lock it with the key provided with the kit.



Drive options

For a list of drive configurations supported in this server, see "Drive numbering (on page 16)."

The embedded storage controller supports SATA drive installation. For SAS drive installation, install an HP Host Bus Adapter or an HP Smart Array Controller board option ("Installing a storage controller and FBWC module" on page 65).

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

Drive installation guidelines

When adding drives to the server, observe the following general guidelines:

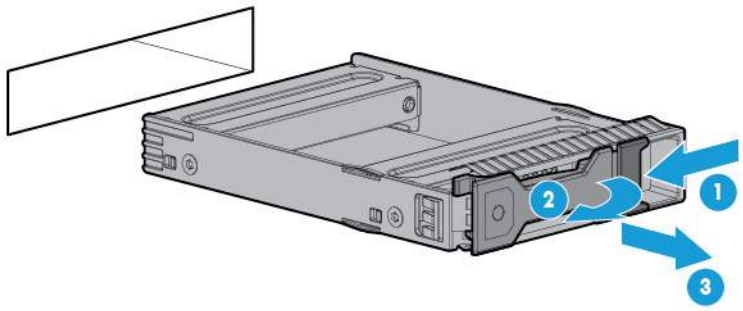
- The system automatically sets all device numbers.
- Populate drive bays, based on the drive numbering sequence. Start from the drive bay with the lowest device number ("Drive numbering" on page 16).
- All drives grouped into the same drive array must meet the following criteria:
  - They must be either all SAS or all SATA.
  - They must be either all hard drives or all solid state drives.
  - For the most efficient use of drive space, the drives must have approximately the same capacity. Each configuration utility treats every physical drive in an array as if it has the same capacity as the smallest drive in the array. Any excess capacity of a particular drive cannot be used in the array and so is unavailable for data storage.

Installing a non-hot-plug drive

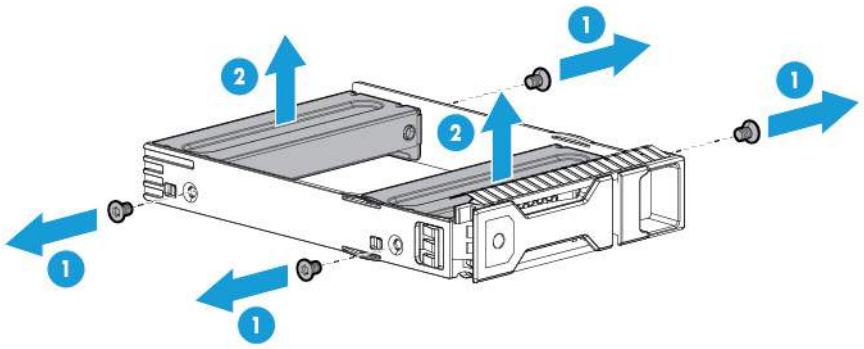
CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

To install the component:

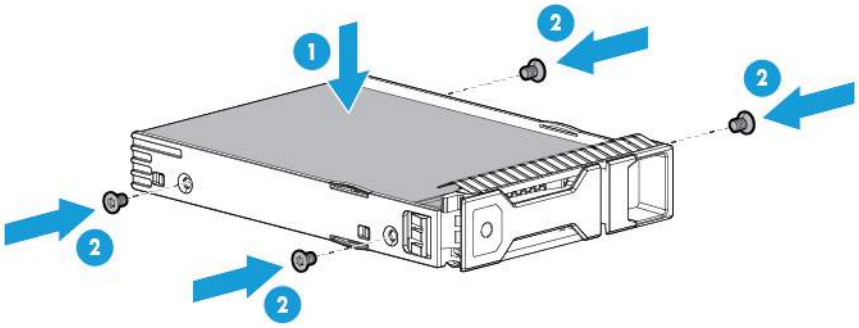
1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Remove the drive carrier.



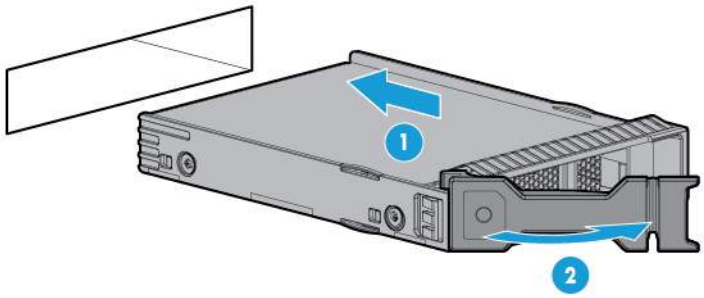
4. Remove the two metal brackets from the drive carrier.



5. Install the drive in the carrier.



6. Install the drive.



△ **CAUTION:** To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

7. Connect each power cord to the server.
8. Connect each power cord to the power source.
9. Power up the server (on page 20).

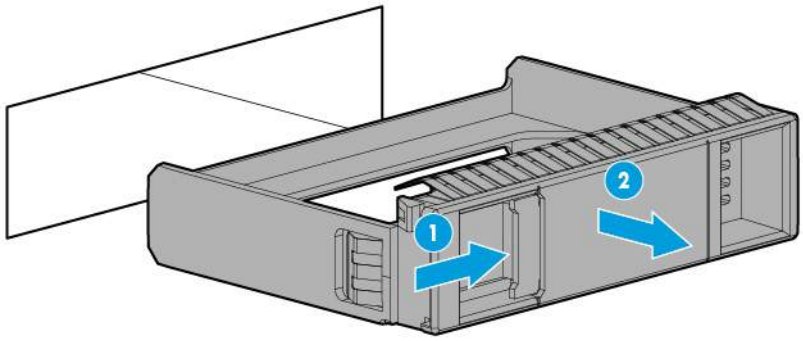
To configure arrays, see the *HP Smart Storage Administrator User Guide* on the HP website (http://www.hp.com/go/smartstorage/docs).

Installing a hot-plug drive

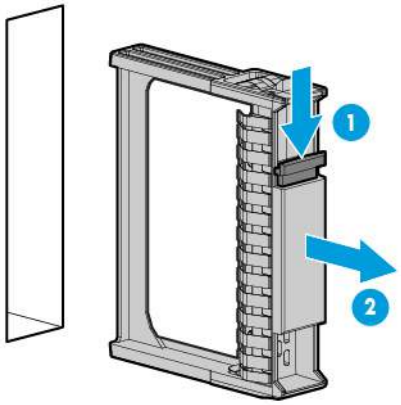
CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

To install the component:

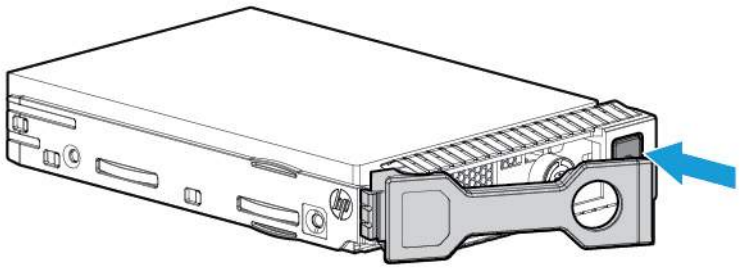
1. Remove the drive blank:
   - LFF drive blank



   - SFF drive blank

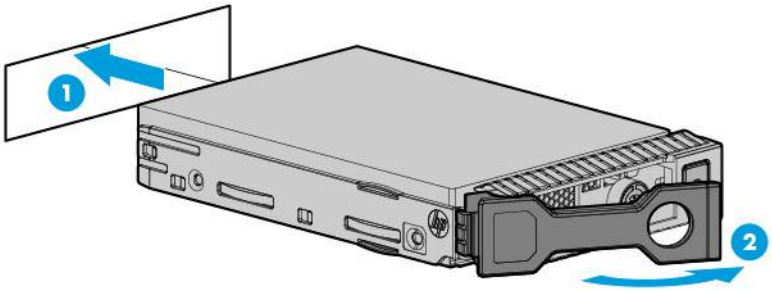


2. Prepare the drive.

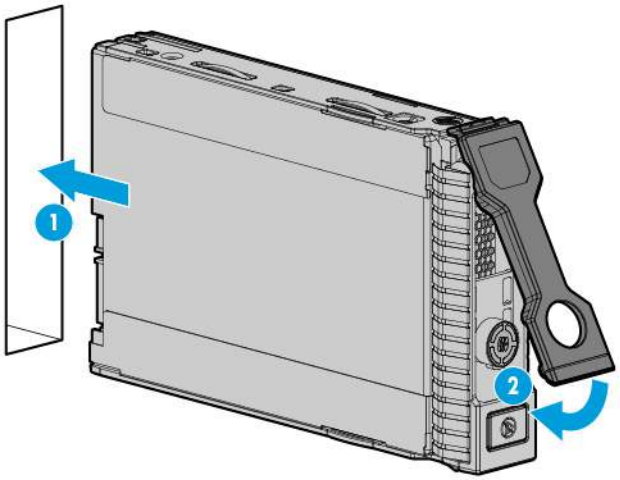


3. Install the drive:

- LFF drive



- SFF drive



4. Determine the status of the drive from the drive LED definitions ("HP SmartDrive LED definitions" on page 16).

To configure arrays, see the *HP Smart Storage Administrator User Guide* on the HP website (http://www.hp.com/go/smartstorage/docs).

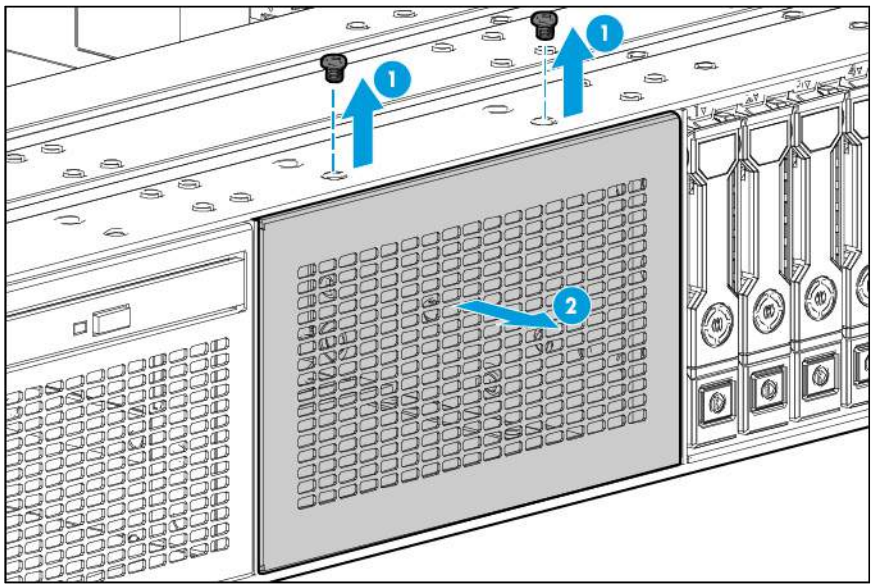
8-bay SFF hot-plug drive cage option

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

To install the component:

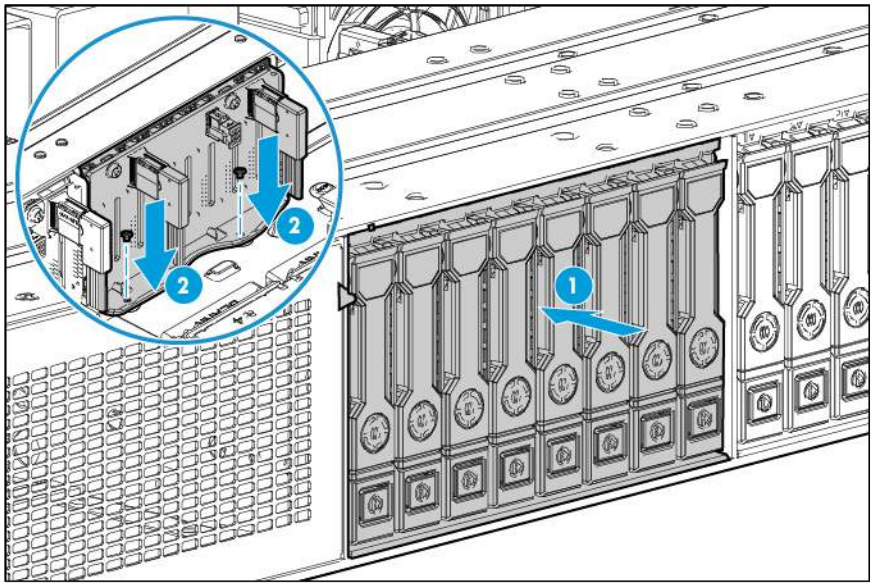
1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).

4. Remove the access panel (on page 24).
5. Use a T-10 Torx screwdriver to remove the box 2 SFF drive cage blank screws, and then remove the blank.



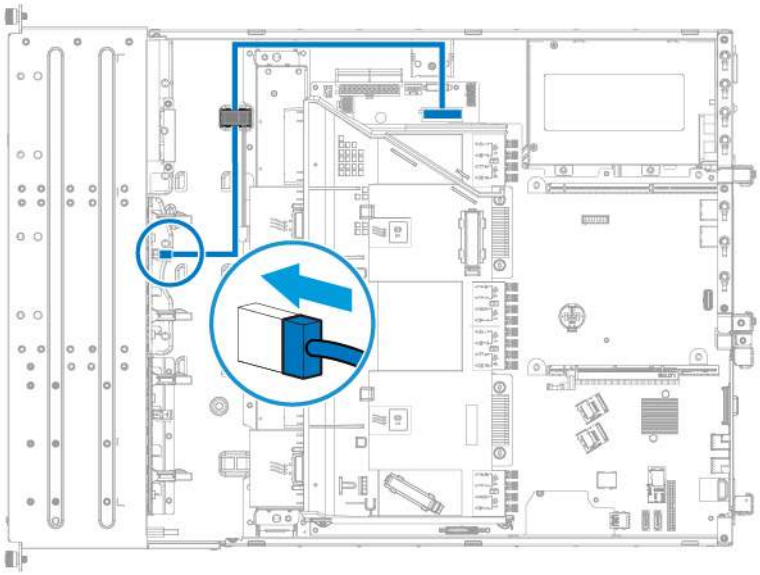
Retain the blank for future use.

6. Install the SFF hot-plug drive cage.

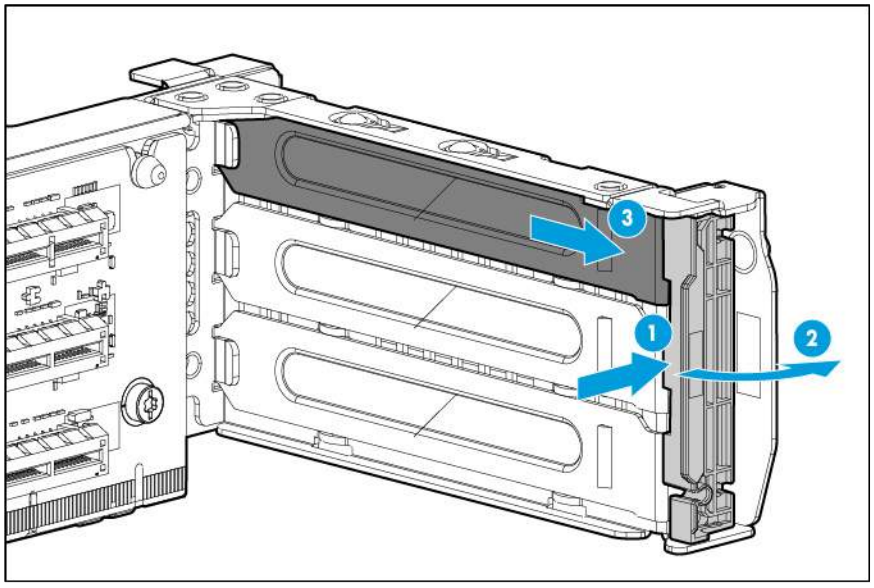


7. Connect the power cable to the new 8-bay SFF hot-plug drive cage:
   a. Secure the power cable in the left front chassis cable clip.

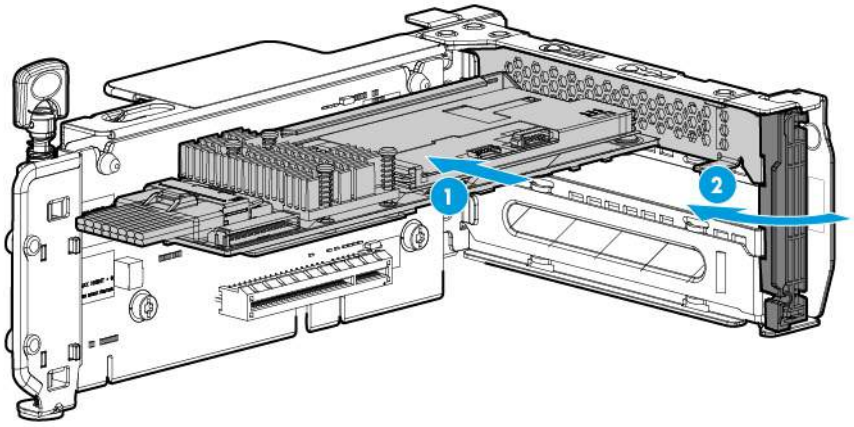
b. Connect the BP2 power connector of the SFF power cable to the 8-bay SFF backplane on box 2.



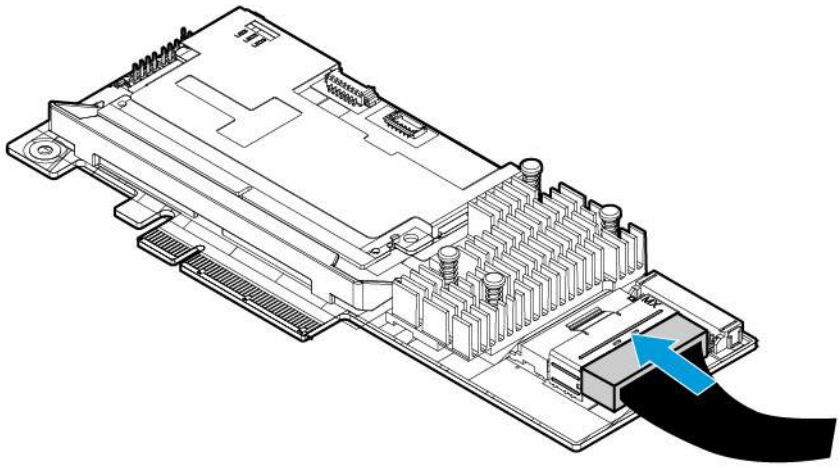
8. Remove the primary PCI riser cage ("Remove the PCI riser cages" on page 25).
9. Install the storage controller:
   a. Identify the expansion slot compatible with the new option, and then remove the cover opposite that slot.



b. Install the storage controller. Verify that the board is firmly seated in the slot.

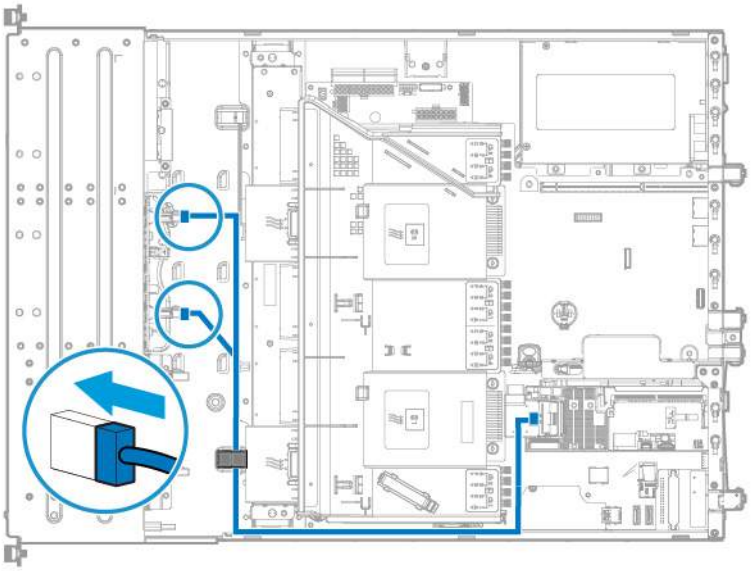


10. Connect the 630-mm Mini-SAS Y-cable:
    a. Connect the common end of the Mini-SAS Y-cable to the controller option.



    b. Install the primary PCI riser cage ("Install the PCI riser cages" on page 26).
    c. Route the split ends of the Mini-SAS Y-cable through the cable clip on the air baffle, and then connect the cable to the drive backplane.

d. Secure the Mini-SAS Y-cable in the right front chassis cable clip.



11. Install the access panel (on page 25).
12. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
13. Power up the server (on page 20).
14. Install the drives ("Drive options" on page 42).

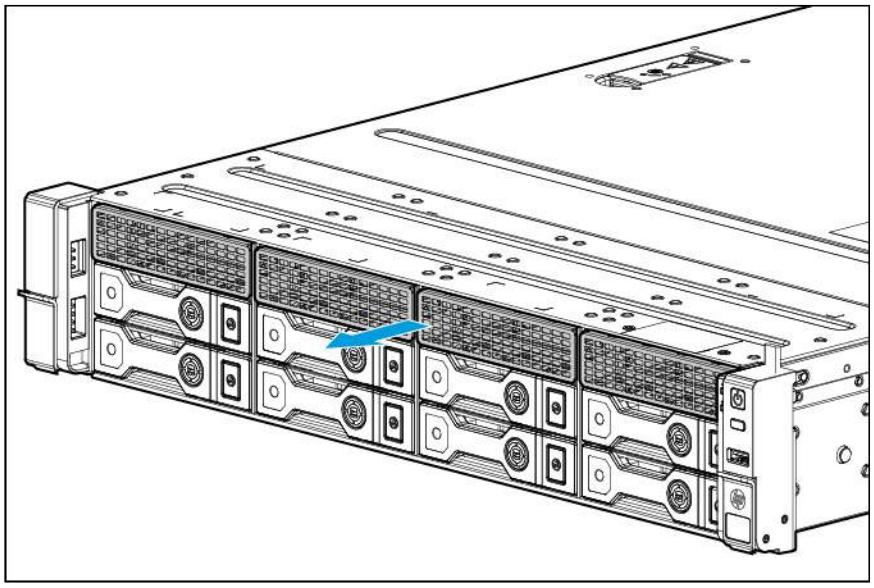
12-bay LFF hot-plug drive enablement option

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

To install the component:

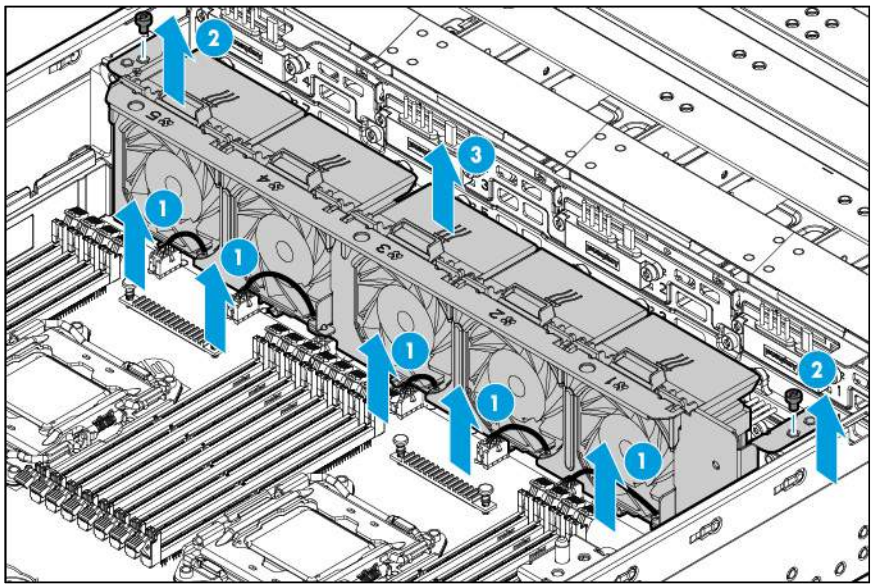
1. Power down the server (on page 20).
2. Remove all power:
    a. Disconnect each power cord from the power source.
    b. Disconnect each power cord from the server.
3. Do one of the following:
    - Extend the server from the rack (on page 20).
    - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).

5. Use a flathead screwdriver to carefully pry the blanks from the box 1 drive bays 1-4.



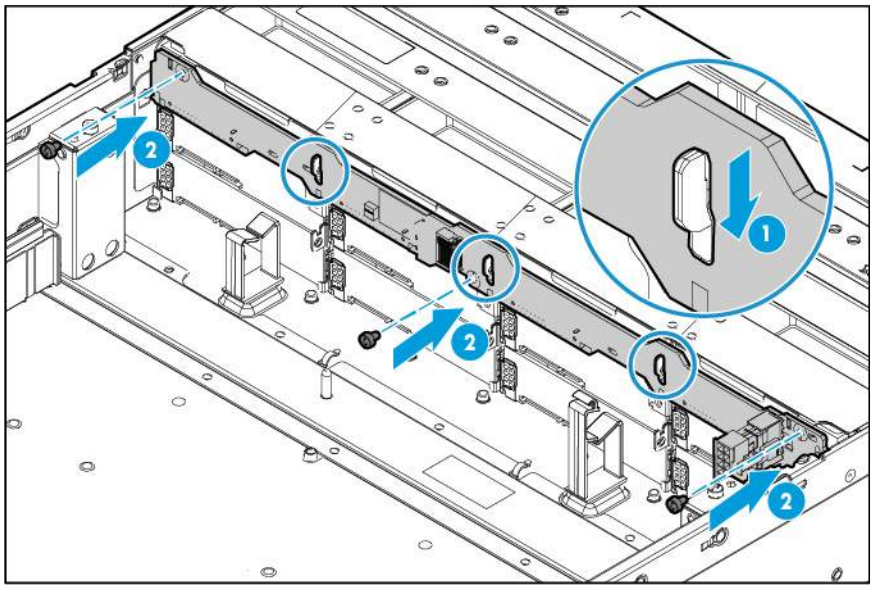
Retain the blanks for future use.

6. Remove the primary PCI riser cage ("Remove the PCI riser cages" on page 25).
7. Remove the air baffle (on page 27).
8. Disconnect the fan cables.
9. Remove the fan cage.

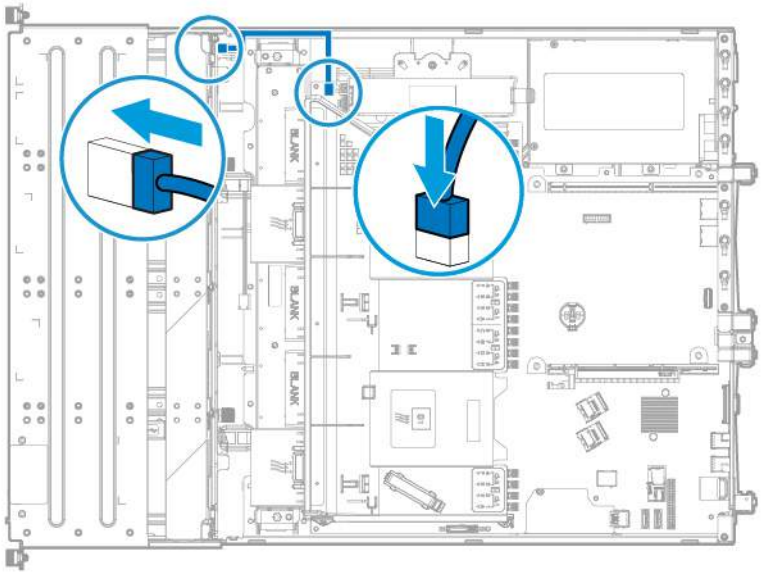


10. Install the 4-bay LFF hot-plug drive cage backplane:
    a. Insert the guide tabs on the rear of the cage into the corresponding backplane slots.

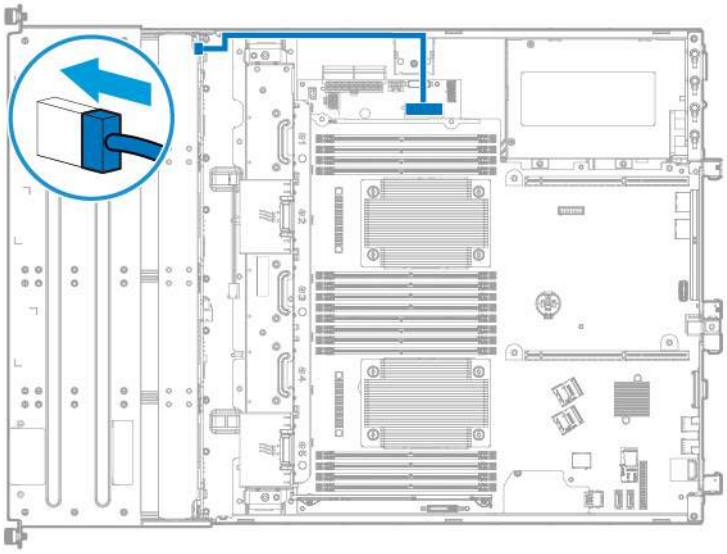
b. Secure the backplane with the three screws.



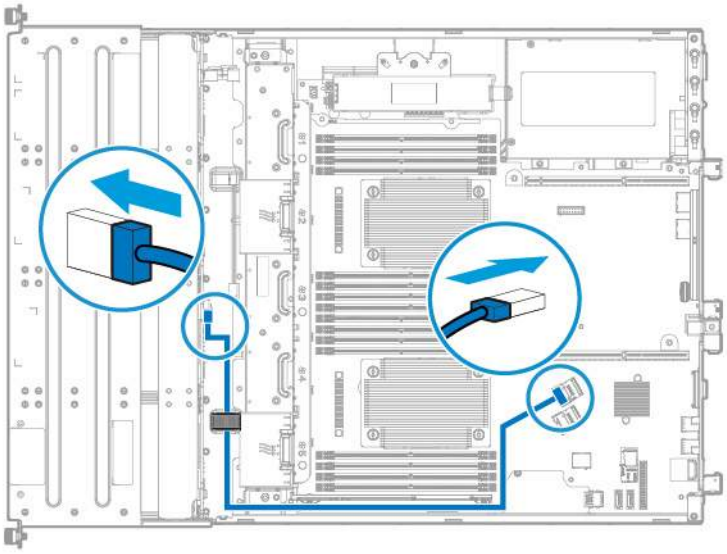
11. Install the fan cage.
12. Connect the fan cables.
13. Connect the 12-bay LFF drive identification signal cable to the 8-bay LFF hot-plug drive cage backplane, and then to the system board.



14. Connect the BP1 power connector of the LFF power cable to the 4-bay LFF hot-plug drive cage backplane.

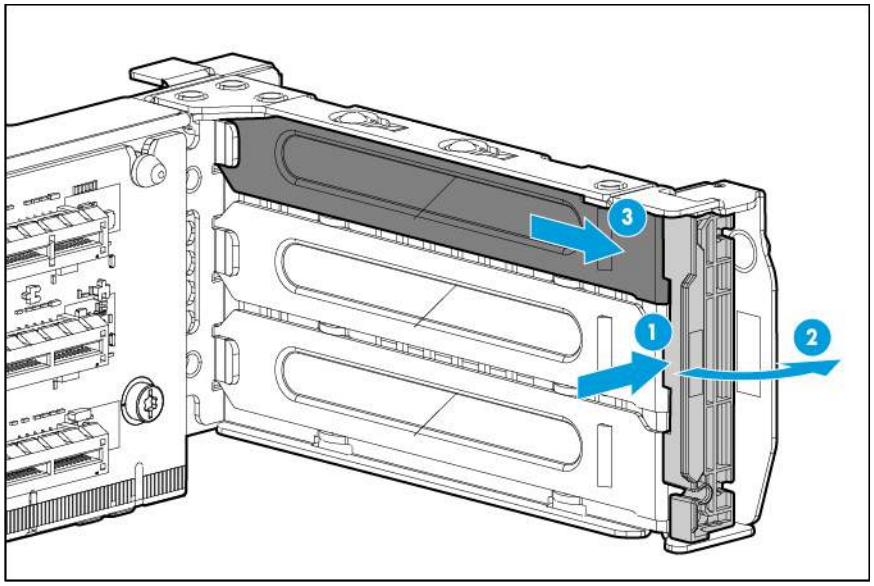


15. To connect the 4-bay LFF hot-plug drive backplane to the onboard controller, connect the 520-mm Mini-SAS cable:
    a. Connect the Mini-SAS cable to the system board.
    b. Route the Mini-SAS cable along the side of the system board towards the front chassis, and then connect the cable to the drive backplane.
    c. Secure the Mini-SAS cable in the right front chassis cable clip.

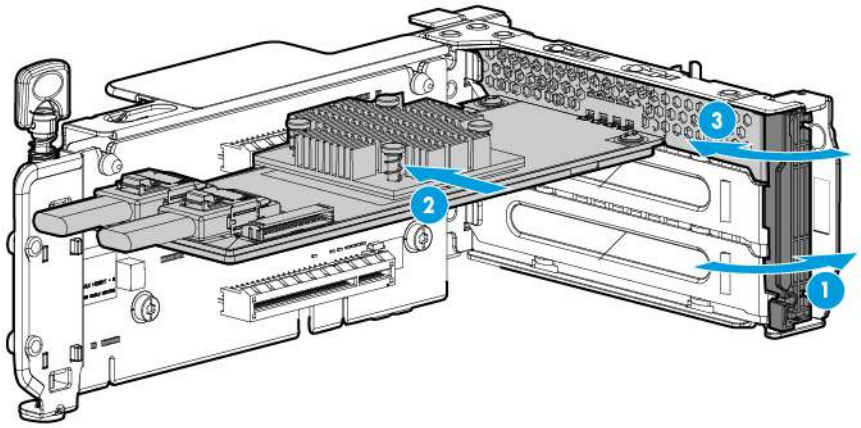


    d. Install the air baffle (on page 30).
    e. Install the primary PCI riser cage ("Install the PCI riser cages" on page 26).
16. To connect the 4-bay LFF hot-plug drive backplane to an HBA option, connect the 540-mm Mini-SAS cable:

a. Identify the riser slot compatible with the new option, and then remove the cover opposite from that slot.

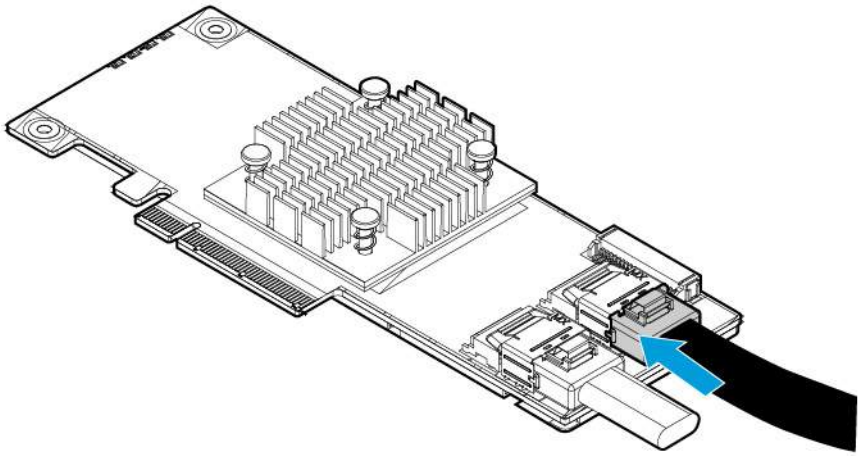


b. Install the HBA. Verify that the board is firmly seated in the slot.



For more information about the HBA and its features, select the relevant user documentation on the HP website (http://www.hp.com/go/smartstorage/docs).

c. Connect the Mini-SAS cable to the HBA.

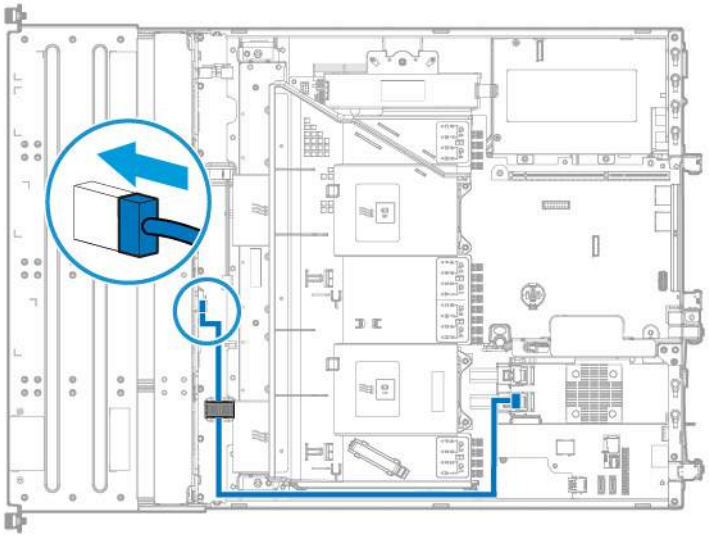


d. Install the air baffle (on page 30).

e. Install the primary PCI riser cage ("Install the PCI riser cages" on page 26).

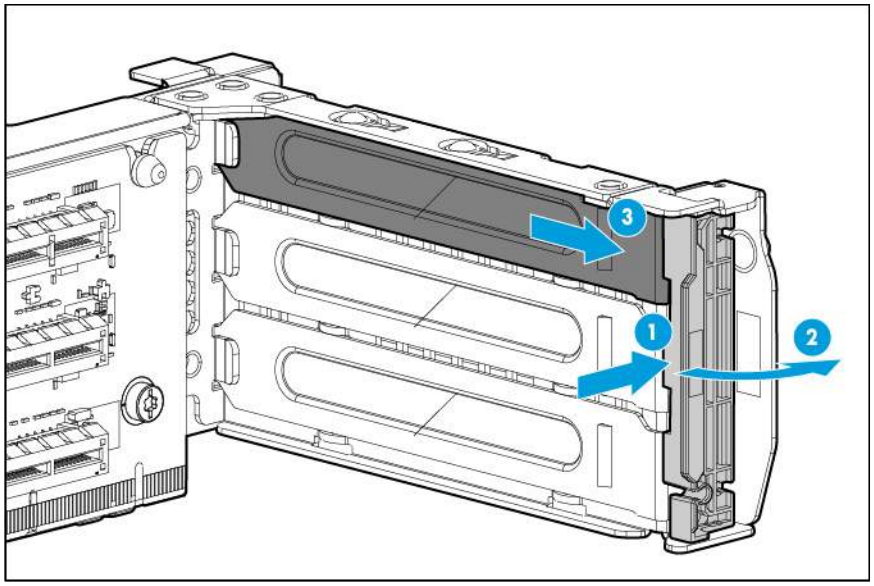
f. Route the Mini-SAS cable through the cable clip on the air baffle, and then connect the cable to the drive backplane.

g. Secure the Mini-SAS cable in the right front chassis cable clip.

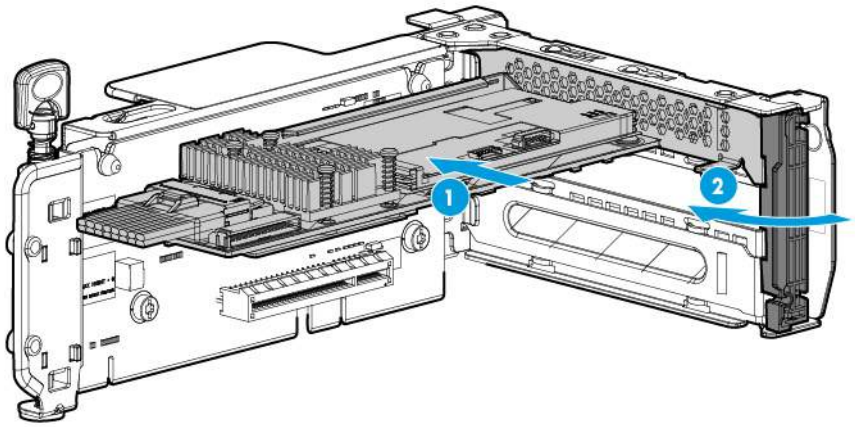


17. To connect the 4-bay LFF hot-plug drive backplane to an HP Smart Array P-series Controller option, connect the 540-mm Mini-SAS cable:

a. Identify the riser slot compatible with the new option, and then remove the cover opposite from that slot.

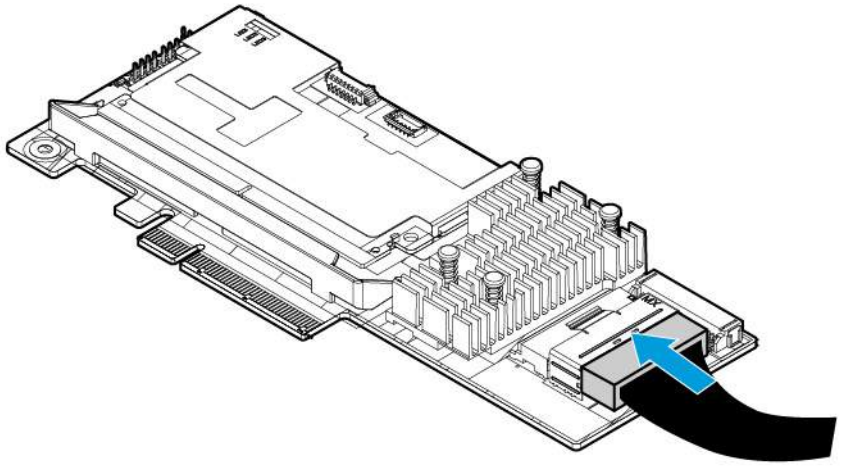


b. Install the storage controller. Verify that the board is firmly seated in the slot.

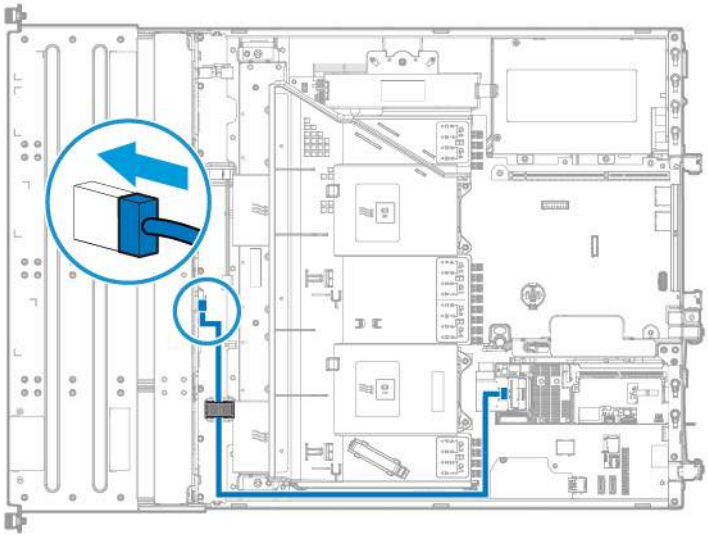


For more information about the integrated storage controller and its features, select the relevant user documentation on the HP website (http://www.hp.com/go/smartstorage/docs).

c. Connect the Mini-SAS cable to the storage controller.



d. Install the air baffle (on page 30).
e. Install the primary PCI riser cage ("Install the PCI riser cages" on page 26).
f. Route the Mini-SAS cable through the cable clip on the air baffle, and then connect the cable to the drive backplane.
g. Secure the Mini-SAS cable in the right front chassis cable clip.



18. Install the access panel (on page 25).
19. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
20. Power up the server (on page 20).
21. Install the drives ("Drive options" on page 42).

Drive cable options

Use these drive cable options to install an HP Host Bus Adapter or an HP Smart Array Controller board option.

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

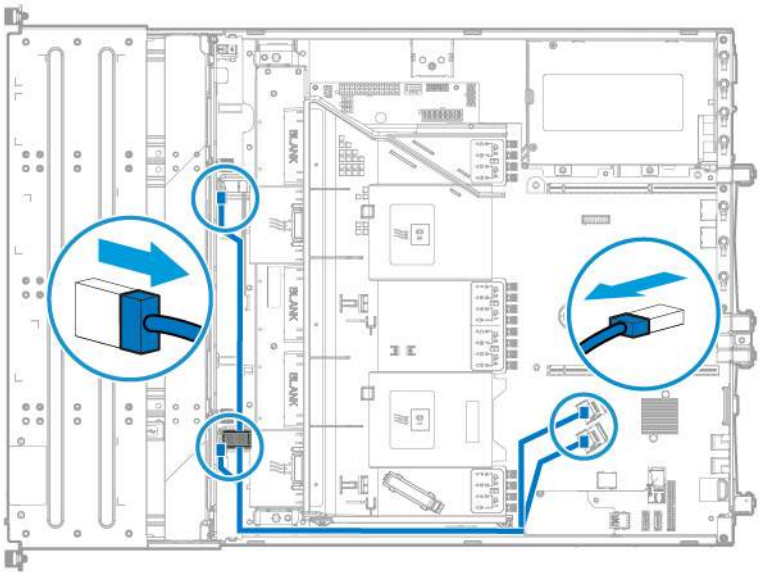
Connecting the Mini-SAS Y-cable option for 8-bay LFF hot-plug drive configurations

This section explains how to connect the 620-mm Mini-SAS Y-cable option to upgrade the 8-bay LFF hot-plug drive connection from the onboard storage controller or from an HBA to an HP Smart Array P-series Controller.

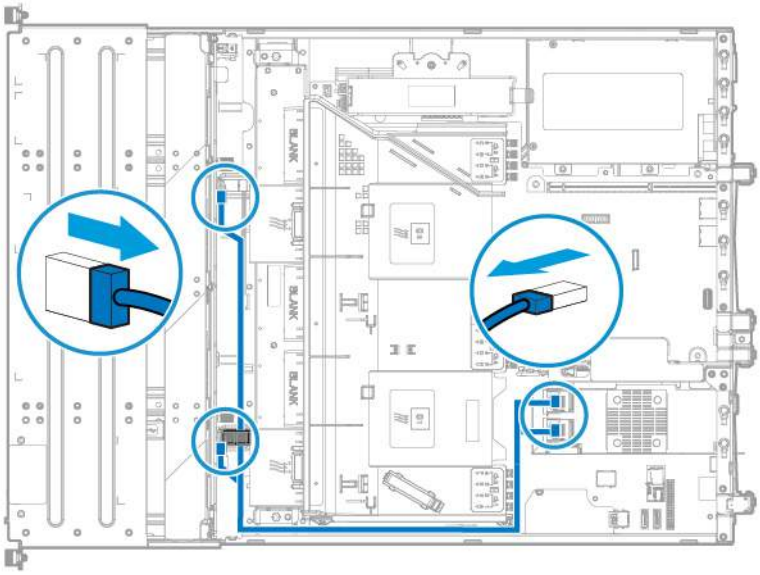
To connect the cable option:

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. If the 8-bay LFF hot-plug drive cage is currently connected to the Mini-SAS connectors on the system board, do the following:
   a. If an expansion board is installed in the primary PCI riser cage, then remove the PCI riser cage ("Remove the PCI riser cages" on page 25).
   b. Disconnect the existing Mini-SAS cables from the drive backplane and the Mini-SAS connectors on the system board.

c. Release the Mini-SAS cables from the right front chassis cable clip.

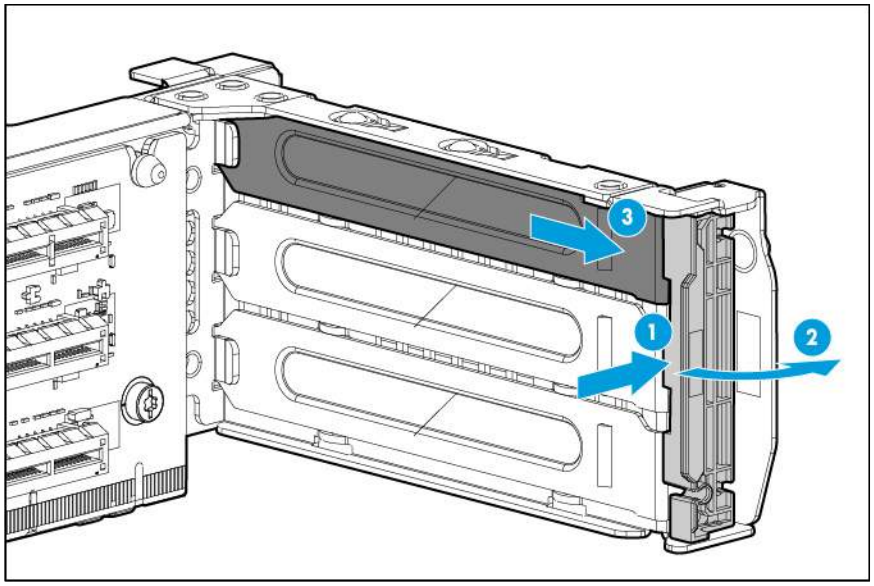


6. If the 8-bay LFF hot-plug drive cage is currently connected to an HBA, do the following:
   a. Disconnect the existing Mini-SAS cables from the drive backplane and the HBA.

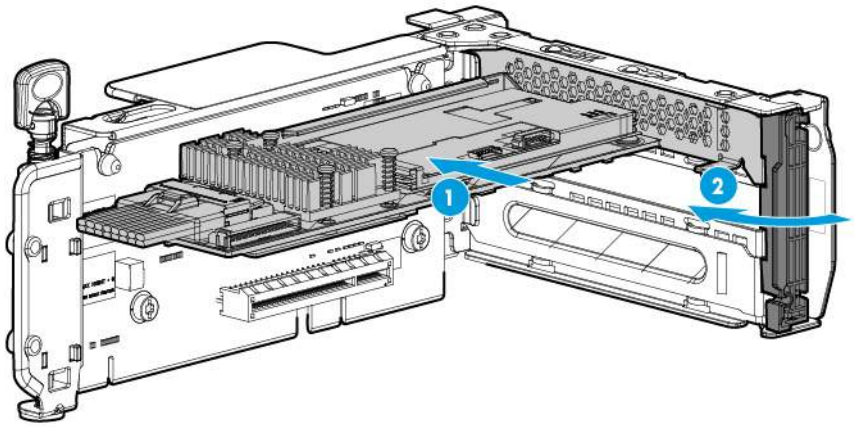


   b. Remove the primary PCI riser cage ("Remove the PCI riser cages" on page 25).
   c. Remove the HBA from the PCI riser cage.
7. Install the storage controller:

a. Identify the expansion slot compatible with the new option, and then remove the cover opposite that slot.

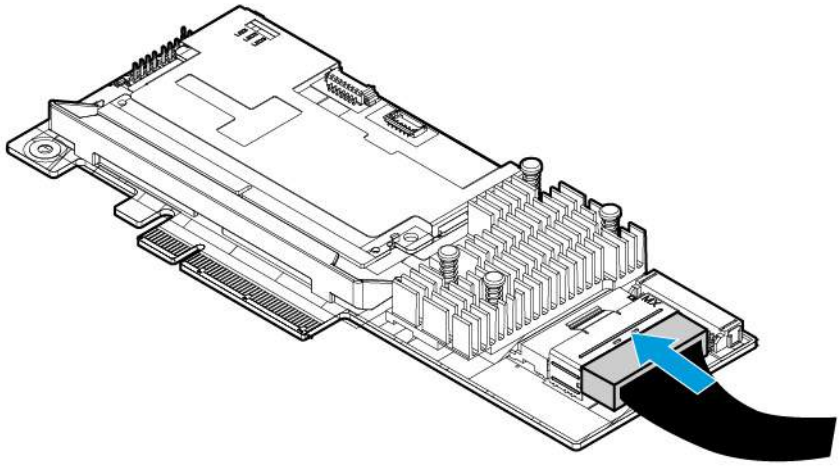


b. Install the storage controller. Verify that the board is firmly seated in the slot.



8. Connect the 620-mm Mini-SAS Y-cable:

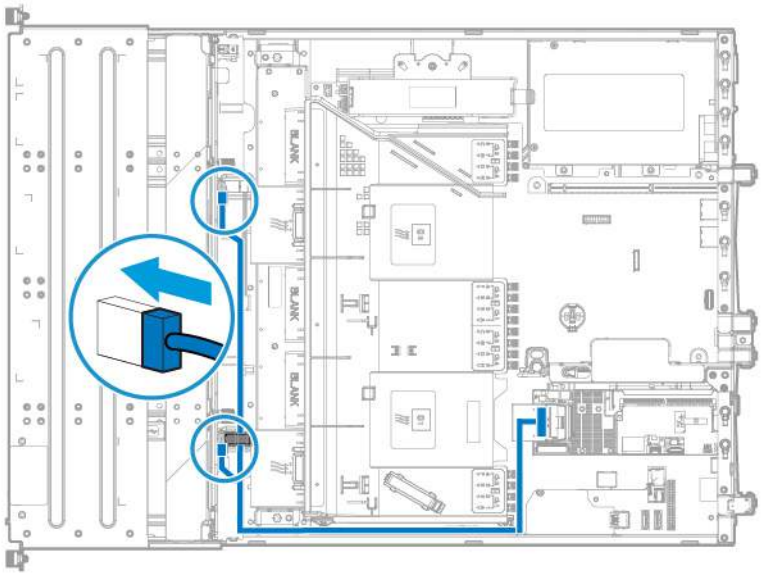
a. Connect the common end of the Mini-SAS Y-cable to the controller option.



b. Install the primary PCI riser cage ("Install the PCI riser cages" on page 26).

c. Route the split ends of the Mini-SAS Y-cable through the cable clip on the air baffle, and then connect the cable to the drive backplane.

d. Secure the Mini-SAS Y-cable in the right front chassis cable clip.



9. Install the access panel (on page 25).
10. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
11. Power up the server (on page 20).
12. If you are planning to install new drives, install them now ("Drive options" on page 42).

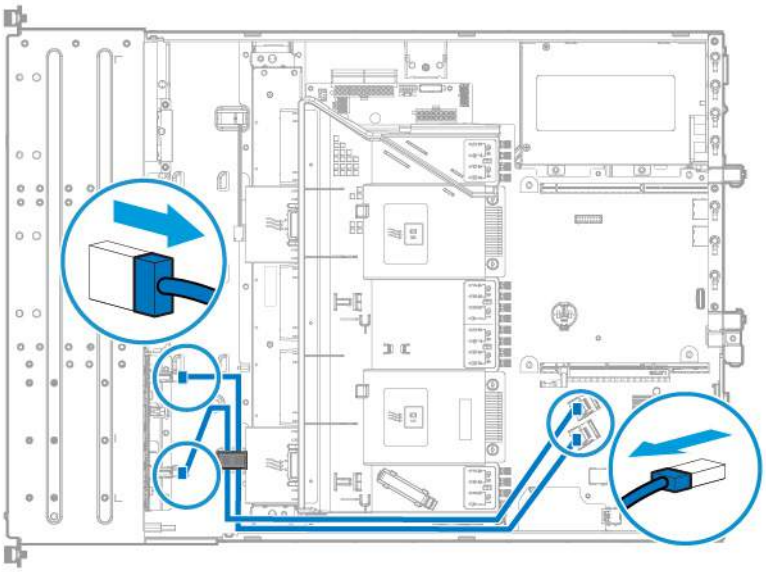
Connecting the Mini-SAS Y-cable option for 8-bay SFF hot-plug drive configurations

This section explains how to connect the 630-mm Mini-SAS Y-cable option to upgrade the fixed 8-bay SFF hot-plug drive cage (box 3) connection from the onboard storage controller or from an HBA to an HP Smart Array P-series Controller.

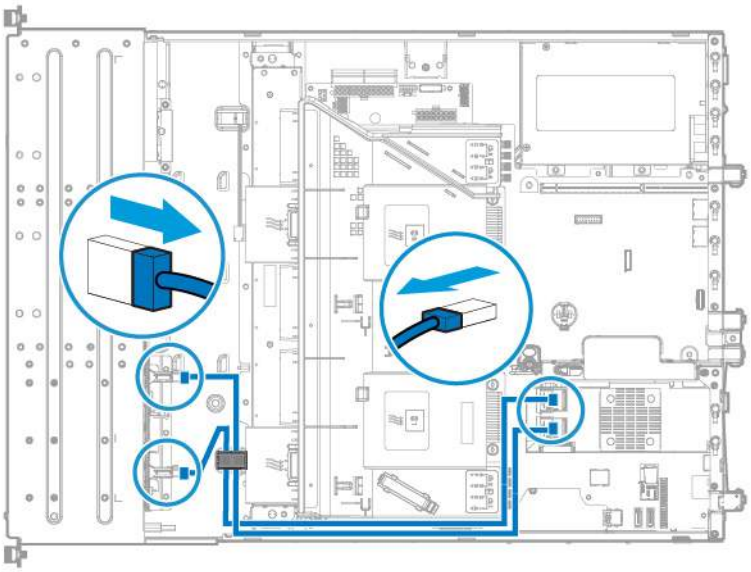
To connect the cable option:

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).

5. If the fixed 8-bay SFF hot-plug drive cage (box 3) is currently connected to the Mini-SAS connectors on the system board, do the following:
   a. If an expansion board is installed in the primary PCI riser cage, then remove the PCI riser cage ("Remove the PCI riser cages" on page 25).
   b. Disconnect the existing Mini-SAS cables from the drive backplane and the Mini-SAS connectors on the system board.
   c. Release the Mini-SAS cables from the right front chassis cable clip.

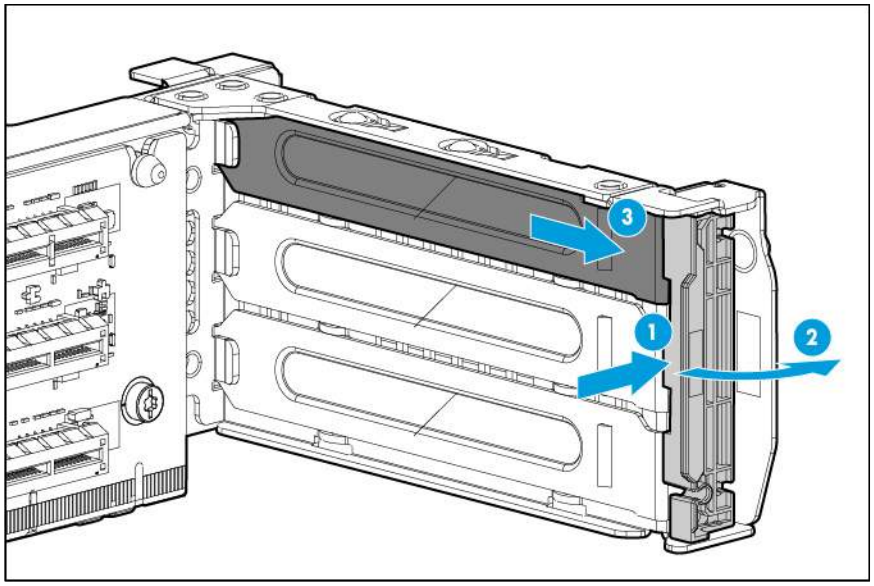


6. If the fixed 8-bay SFF hot-plug drive cage (box 3) is currently connected to an HBA, do the following:
   a. Disconnect the existing Mini-SAS cables from the drive backplane and the HBA.

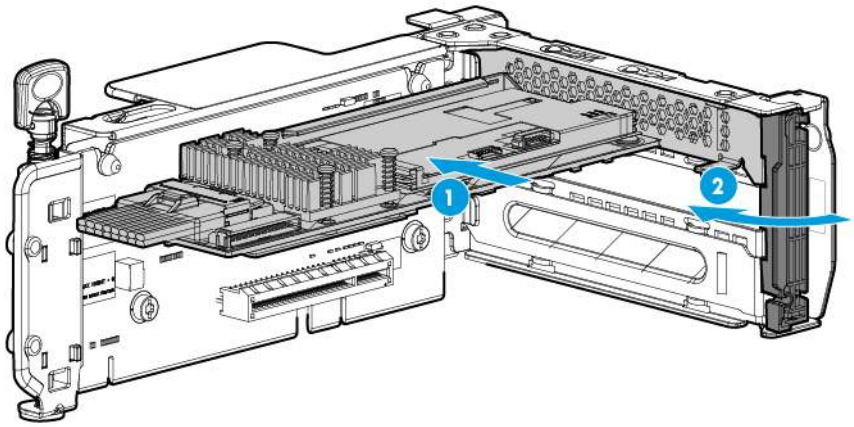


   b. Remove the primary PCI riser cage ("Remove the PCI riser cages" on page 25).
   c. Remove the HBA from the PCI riser cage.
7. Install the storage controller:

a. Identify the expansion slot compatible with the new option, and then remove the cover opposite that slot.

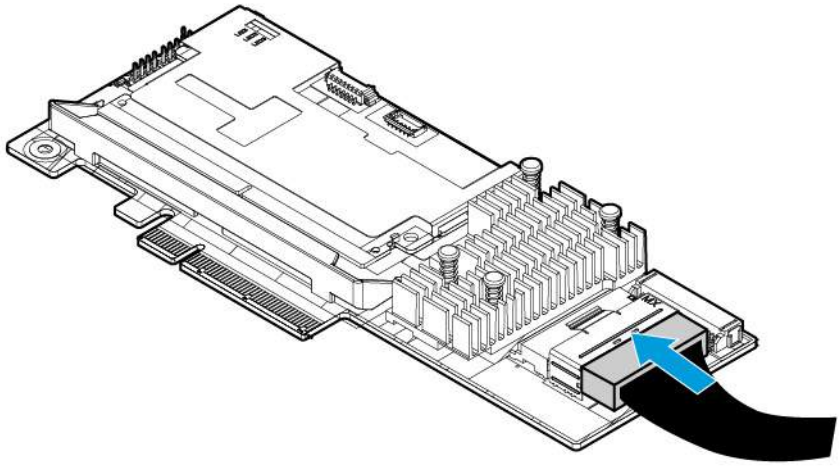


b. Install the storage controller. Verify that the board is firmly seated in the slot.



8. Connect the 620-mm Mini-SAS Y-cable:

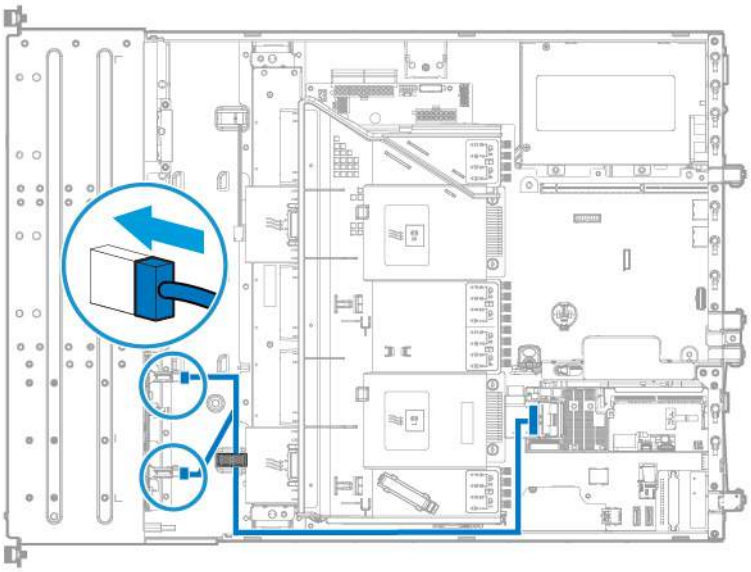
a. Connect the common end of the Mini-SAS Y-cable to the controller option.



b. Install the primary PCI riser cage ("Install the PCI riser cages" on page 26).

c. Route the split ends of the Mini-SAS Y-cable through the cable clip on the air baffle, and then connect the cable to the drive backplane.

d. Secure the Mini-SAS Y-cable in the right front chassis cable clip.



9. Install the access panel (on page 25).
10. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
11. Power up the server (on page 20).
12. If you are planning to install new drives, install them now ("Drive options" on page 42).

Controller options

The server ships with an embedded HP Dynamic Smart Array B140i Controller. For more information about the controller and its features, see the *HP Dynamic Smart Array B140i RAID Controller User Guide* on the HP website (http://www.hp.com/go/smartstorage/docs).

Upgrade options exist for an integrated array controller. For a list of supported options, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

To configure arrays, see the *HP Smart Storage Administrator User Guide* on the HP website (http://www.hp.com/go/smartstorage/docs).

The server supports FBWC. FBWC consists of a cache module and an HP Smart Storage Battery Pack. The DDR cache module buffers and stores data being written by an integrated Gen9 P-series Smart Array Controller.

This server supports the 96-W HP Smart Storage Battery Pack. This battery pack can support up to 24 devices. Devices in this context refer to the HP Smart Array Controller or NVDIMM associated with the cache module.

The battery pack might have a low charge when installed. If the battery does have low charge, a POST error message appears when the server is powered up, indicating that the battery pack is temporarily disabled.

No action is necessary. The internal circuitry automatically recharges the batteries and enables the battery pack. When the system is powered on this process might take approximately 2 hours.

If a system power failure occurs, a fully charged battery pack provides power for up to 150 seconds. During that interval, the controller transfers the cached data from DDR memory to flash memory, where the data remains indefinitely or until a controller retrieves the data. The data protection and the time limit also apply if a power outage occurs. When power is restored to the system, an initialization process writes the preserved data to the storage drives.

CAUTION: The cache module connector does not use the industry-standard DDR3 mini-DIMMs. Do not use the controller with cache modules designed for other controller models, because the controller can malfunction and you can lose data. Also, do not transfer this cache module to an unsupported controller model, because you can lose data.

CAUTION: To prevent a server malfunction or damage to the equipment, do not add or remove the battery pack while an array capacity expansion, RAID level migration, or stripe size migration is in progress.

CAUTION: After the server is powered down, wait for 30 seconds, and then check the amber LED before unplugging the cable from the cache module. If the amber LED flashes after 30 seconds, do not remove the cable from the cache module. The cache module is backing up data. Data will be lost if the cable is detached when the amber LED is still flashing.

Storage controller installation guidelines

To maintain optimal thermal conditions when installing an HP P-series Smart Array Controller or an HP H-Series Host Bus Adapter option, HP recommends the following guidelines:

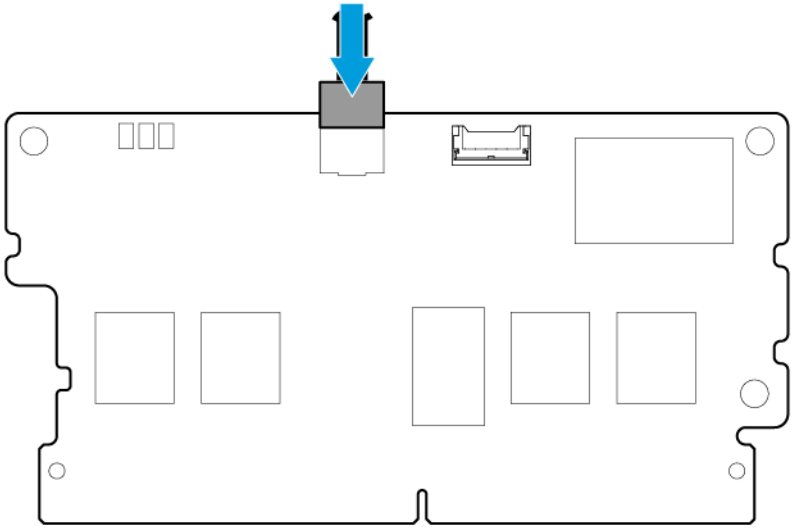
- When installing only one controller board, install the board in slot 2 of either the 2-slot or the 3-slot PCI riser cage assembly installed in the primary PCIe riser location ("PCI riser cage assembly options" on page 86).
- When installing two controller boards, install the controller boards in slots 2 and 3 of the 3-slot PCI riser cage assembly installed in the primary PCIe riser location ("PCI riser cage assembly options" on page 86).

Installing a storage controller and FBWC module

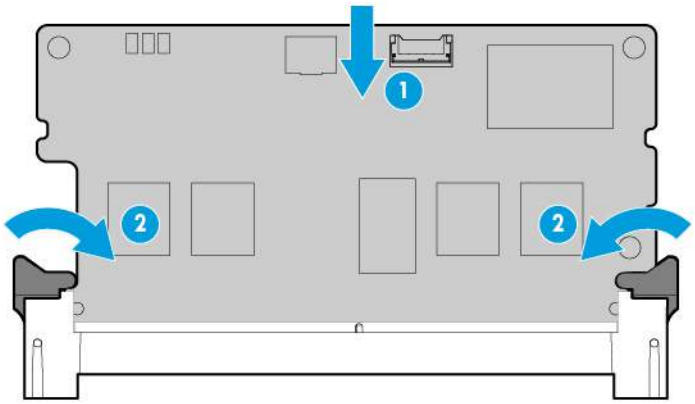
To install the component:

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. Remove the PCI riser cage ("Remove the PCI riser cages" on page 25).

6. If you intend to use an FBWC module, install the module in the storage controller. Depending on the controller model, the cable connector on the cache module might be facing up or down when the module is installed on the controller board.
   a. Connect the cache module cable to the module.

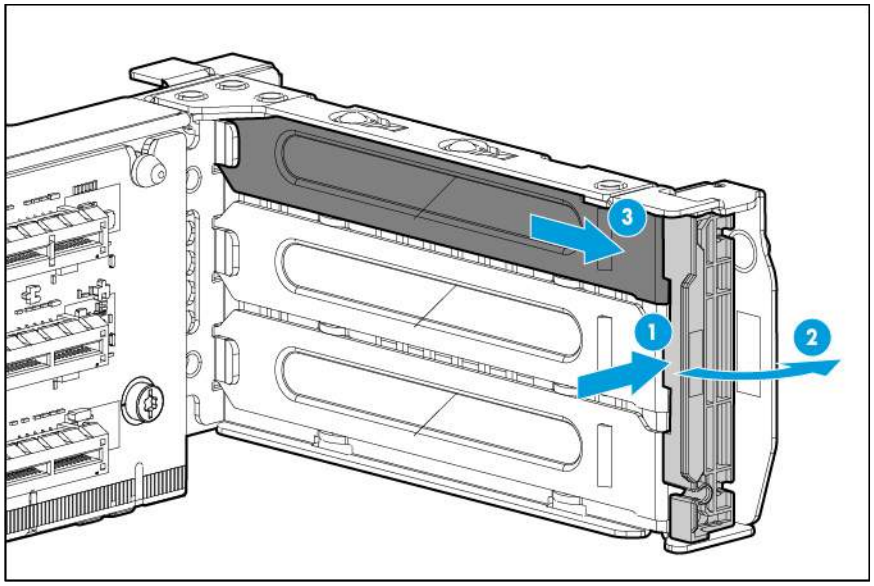


   b. Install the cache module on the storage controller.

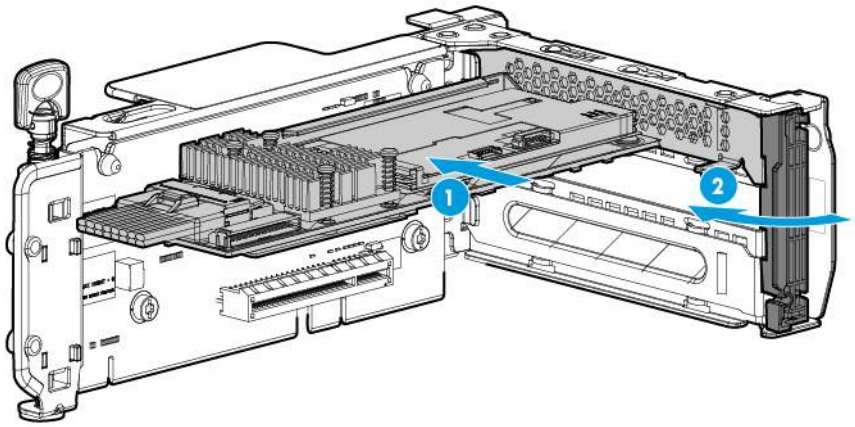


7. Install the storage controller:

a. Identify the expansion slot compatible with the new option, and then remove the cover opposite that slot.

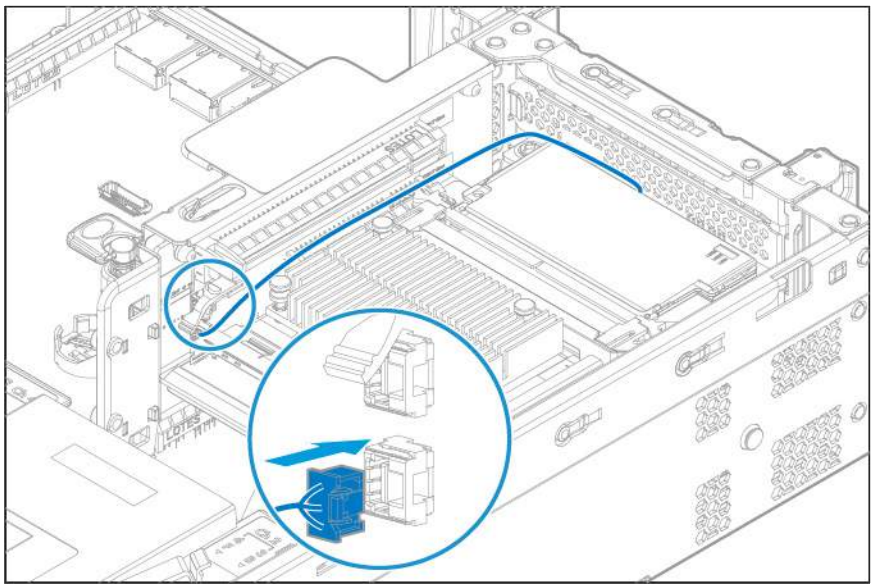


b. Install the storage controller. Verify that the board is firmly seated in the slot.



8. Install the PCI riser cage ("Install the PCI riser cages" on page 26).

9. If you installed a cache module on the storage controller, connect the cache module cable to the riser board.



10. Connect all necessary internal cables to the storage controller. For internal drive cabling information, see "Storage cabling (on page 96)."
11. If you are planning to install an HP Smart Storage Battery Pack, install it now ("Installing an HP Smart Storage Battery" on page 68).
12. Install the access panel (on page 25).
13. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
14. Power up the server (on page 20).
15. If you are planning to install new drives, install them now ("Drive options" on page 42).

For more information about the integrated storage controller and its features, select the relevant user documentation on the HP website (http://www.hp.com/go/smartstorage/docs).

To configure arrays, see the *HP Smart Storage Administrator User Guide* on the HP website (http://www.hp.com/go/smartstorage/docs).

Installing an HP Smart Storage Battery

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

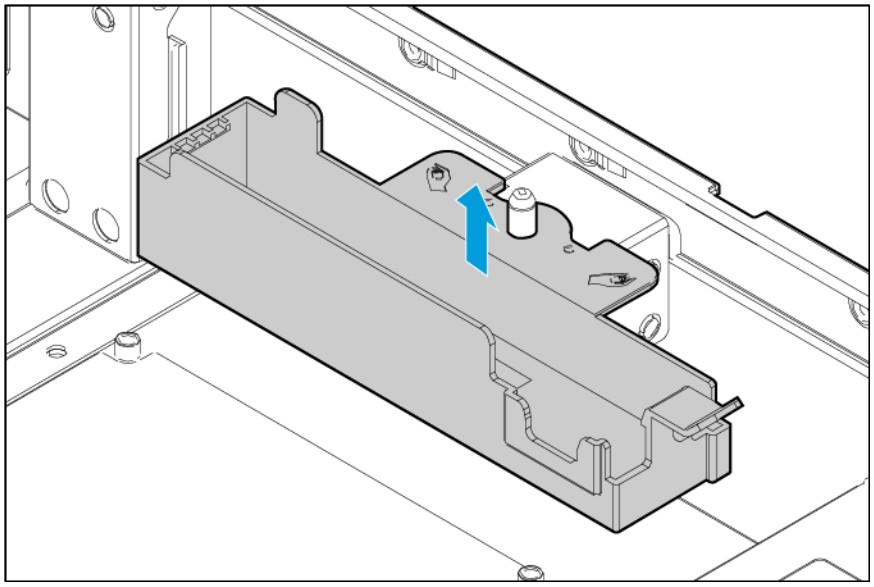
△ **CAUTION:** In systems that use external data storage, be sure that the server is the first unit to be powered down and the last to be powered back up. Taking this precaution ensures that the system does not erroneously mark the external drives as failed when the server is powered up.

To install the component:

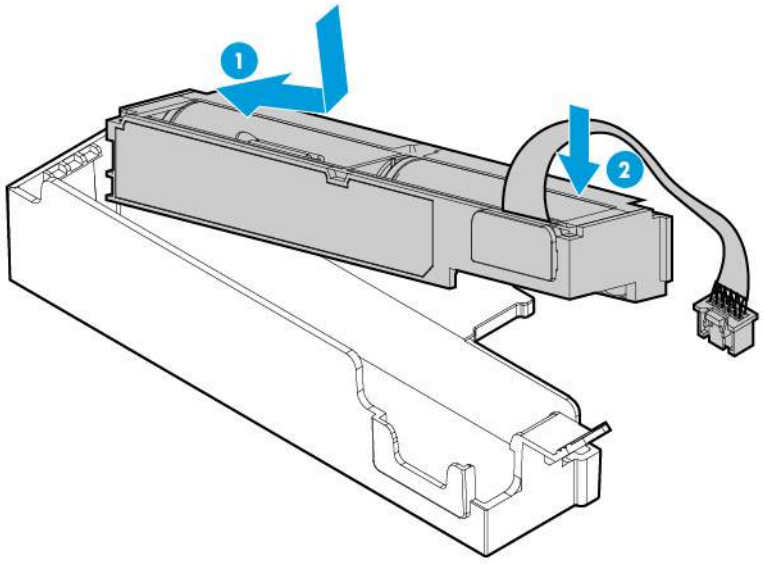
1. Power down the server (on page 20).
2. Remove all power:

a. Disconnect each power cord from the power source.
b. Disconnect each power cord from the server.

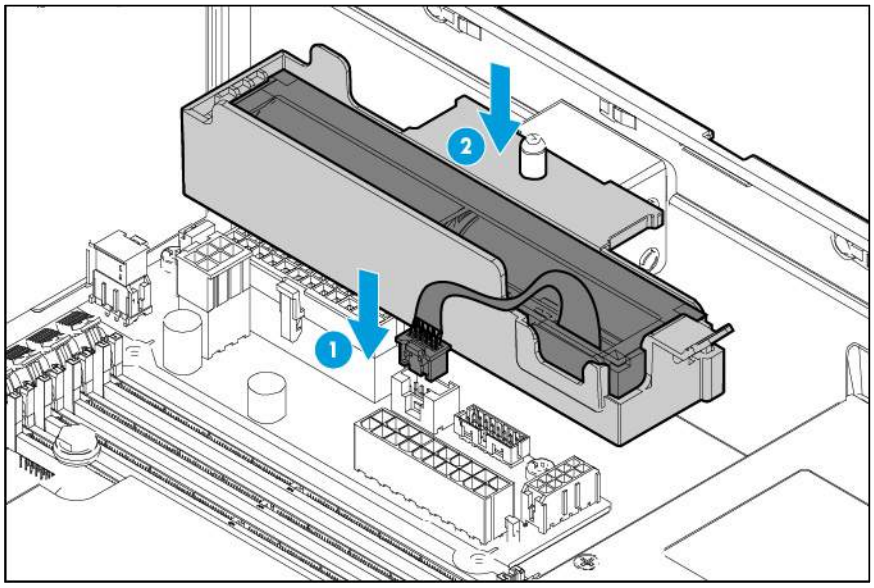
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. Remove the battery pack holder.



6. Install the HP Smart Storage Battery in the holder.



7. Install the HP Smart Storage Battery on the server.



8. Install the access panel (on page 25).
9. Do one of the following:
   - Slide the server into the rack.
   - Install the server into the rack ("Installing the server into the rack" on page 36).
10. Power up the server (on page 20).

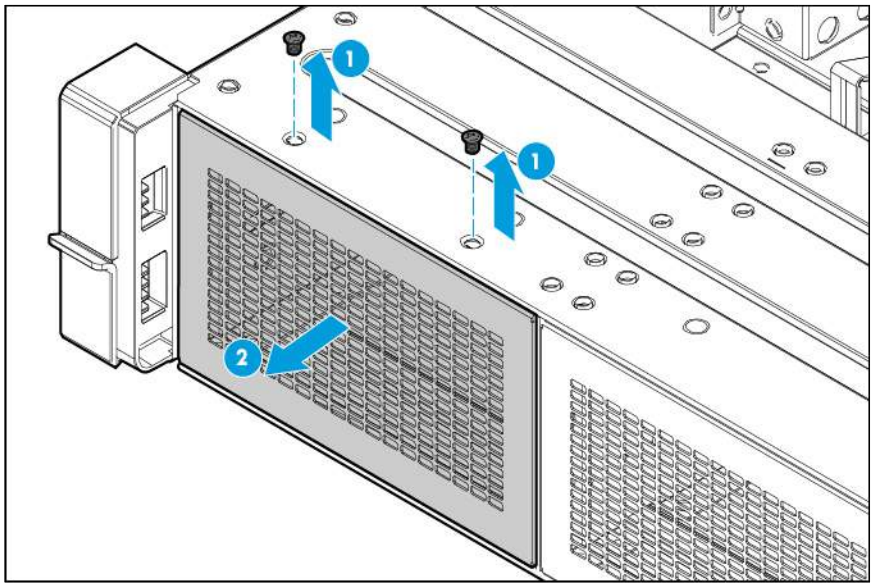
Optical drive cage option

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

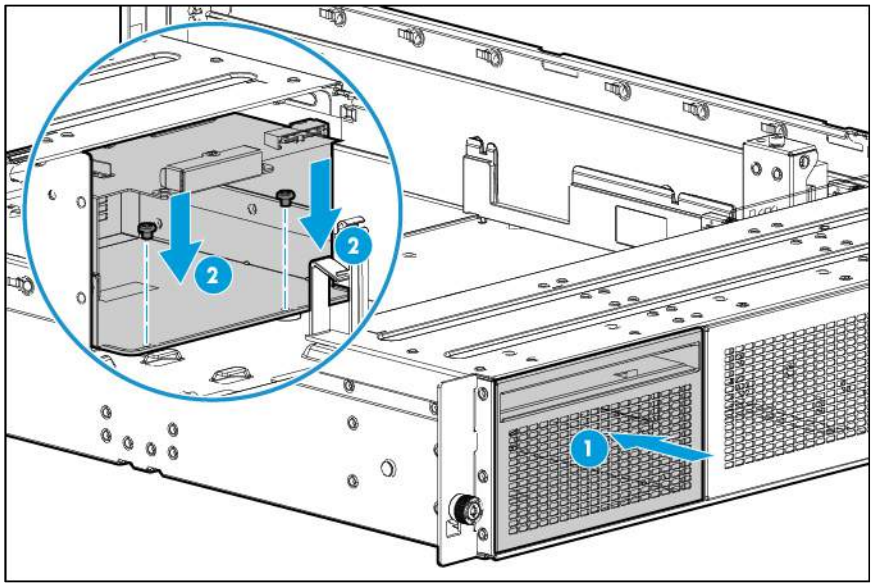
To install the component:

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).

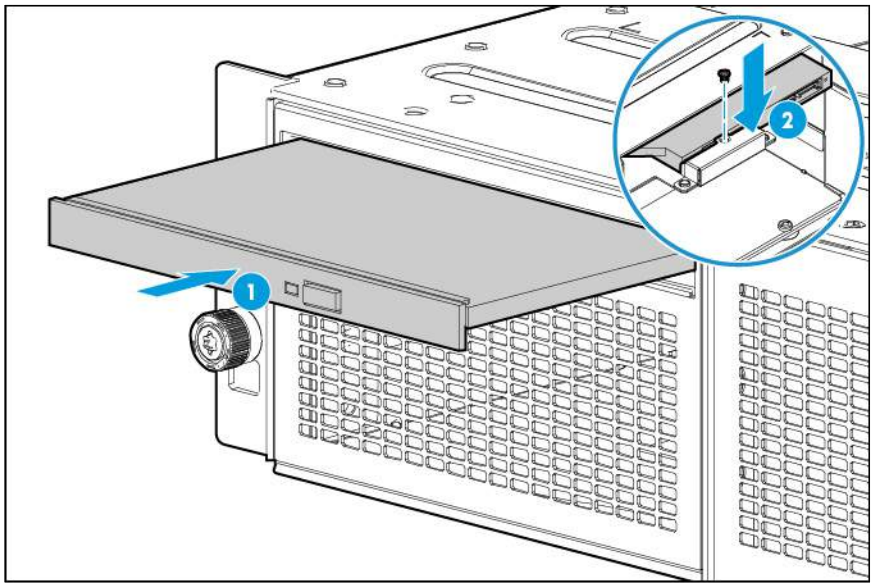
5. Remove the HP Universal Media Bay blank.



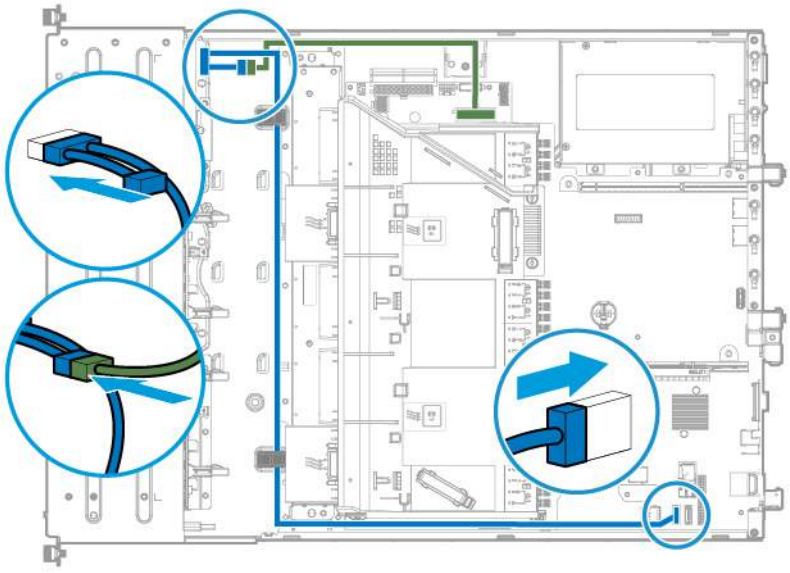
6. Install the optical drive cage.



7. Install the optical drive into the bay.



8. If an expansion board is installed in the primary PCI riser cage, then remove the PCI riser cage ("Remove the PCI riser cages" on page 25).
9. Connect the optical drive cable:
   a. Connect the optical drive cable to the optical drive.
   b. Connect the four-pin (2x2) power supply cable to the power connector of the optical drive cable.
   c. Secure the optical drive cable in the two front chassis cable clips.
   d. Connect the cable to the SATA connector on the system board.



10. If removed, install the primary PCI riser cage ("Install the PCI riser cages" on page 26).
11. Install the access panel (on page 25).
12. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).

13. Power up the server (on page 20).

Processor option

The server supports single-processor and dual-processor operations.

CAUTION: To avoid damage to the processor and system board, only authorized personnel should attempt to replace or install the processor in this server.

CAUTION: To prevent possible server overheating, always populate each processor socket with a processor socket cover and a processor blank, or a processor and a heatsink.

CAUTION: To prevent possible server malfunction and damage to the equipment, multiprocessor configurations must contain processors with the same part number.

IMPORTANT: If installing a processor with a faster speed, update the system ROM before installing the processor.

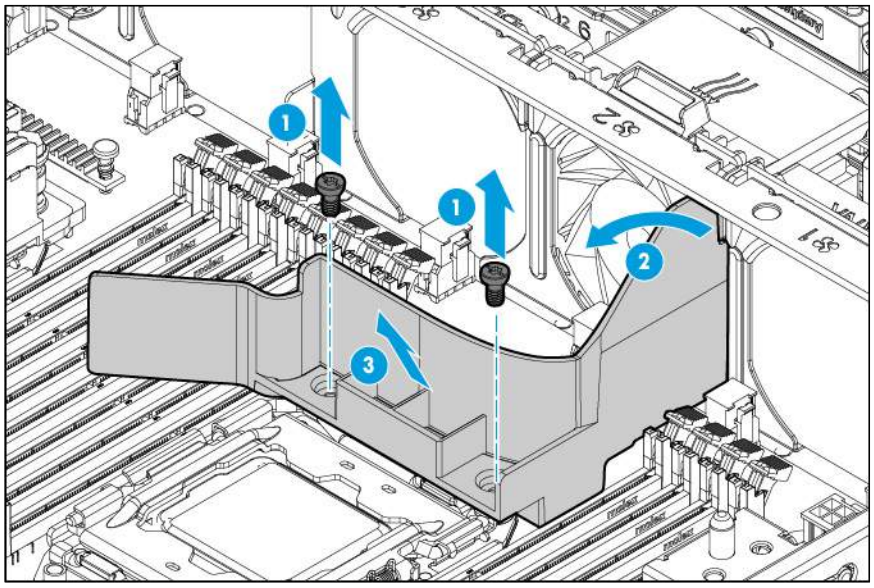
IMPORTANT: Processor socket 1 must be populated at all times or the server does not function.

In a multiprocessor configuration, to optimize system performance, HP recommends balancing the total capacity of the DIMMs across the processors.

To install the component:

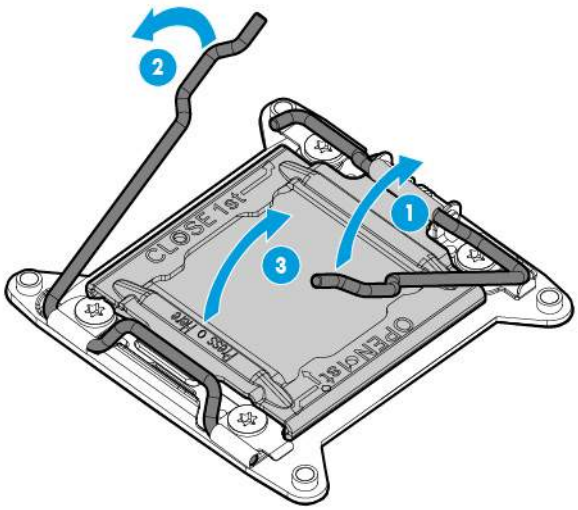
1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. Remove the air baffle (on page 27).

6. Remove the processor blank.

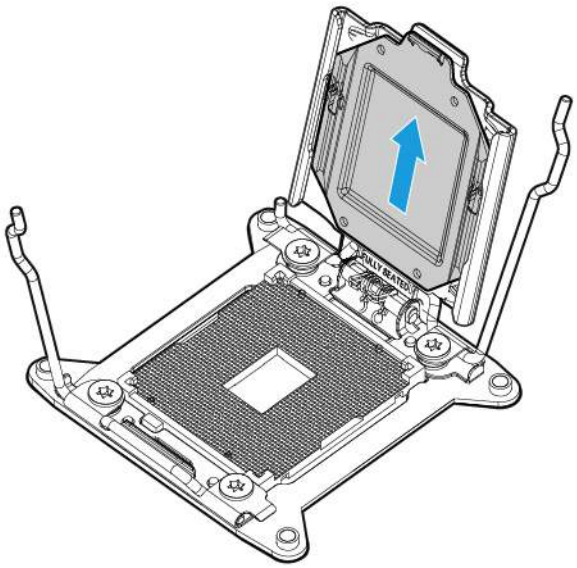


△ **CAUTION:** The pins on the processor socket are very fragile. Any damage to them may require replacing the system board.

7. Open each of the processor locking levers in the order indicated in the following illustration, and then open the processor retaining bracket.

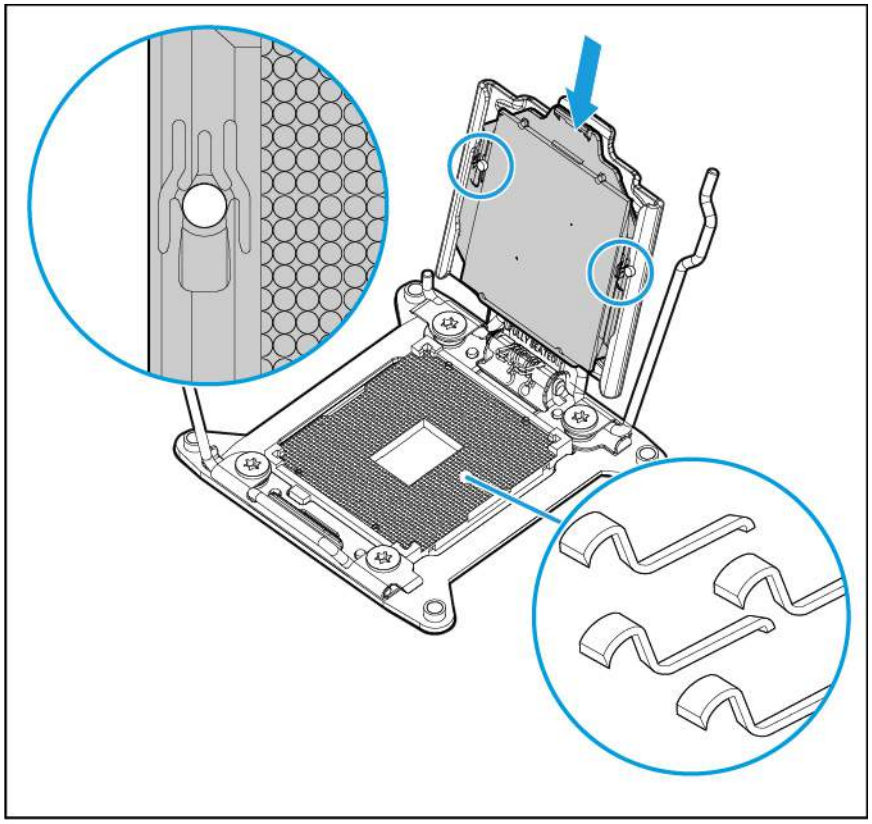


8. Remove the clear processor socket cover. Retain the processor socket cover for future use.



△ **CAUTION: THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED.** To avoid damage to the system board, do not touch the processor or the processor socket contacts.

9. Install the processor. Verify that the processor is fully seated in the processor retaining bracket by visually inspecting the processor installation guides on either side of the processor. **THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED.**

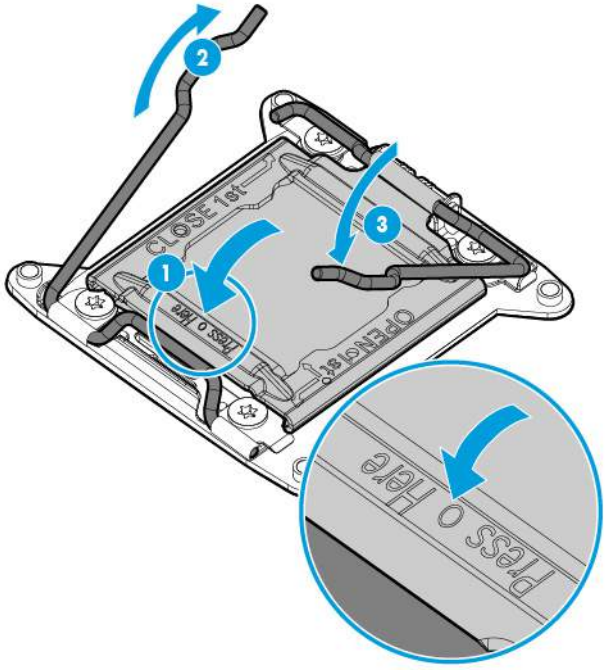


10. Close the processor retaining bracket. When the processor is installed properly inside the processor retaining bracket, the processor retaining bracket clears the flange on the front of the socket.

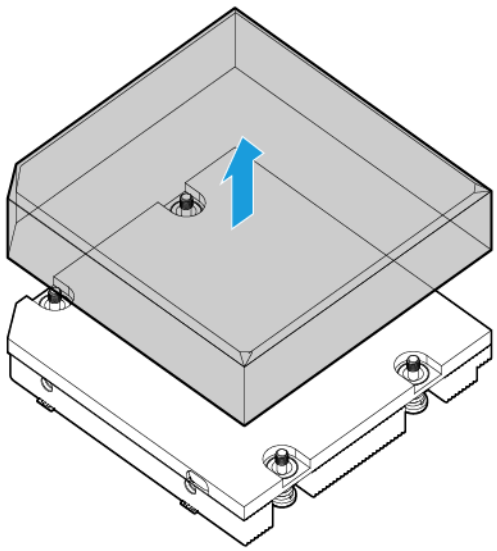
CAUTION: Do not press down on the processor. Pressing down on the processor may cause damage to the processor socket and the system board. Press only in the area indicated on the processor retaining bracket.

CAUTION: Close and hold down the processor cover socket while closing the processor locking levers. The levers should close without resistance. Forcing the levers closed can damage the processor and socket, requiring system board replacement.

11. Press and hold the processor retaining bracket in place, and then close each processor locking lever. Press only in the area indicated on the processor retaining bracket.

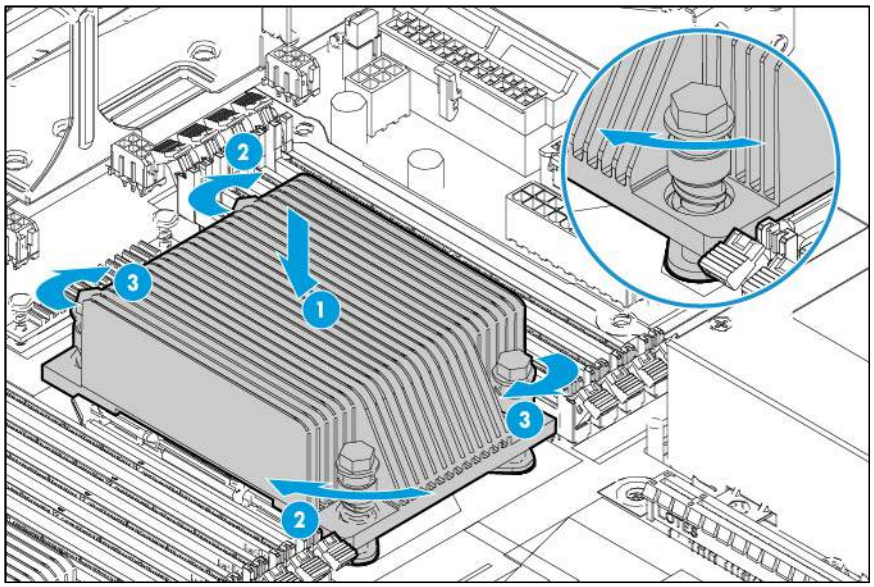


12. Remove the thermal interface protective cover from the heatsink.

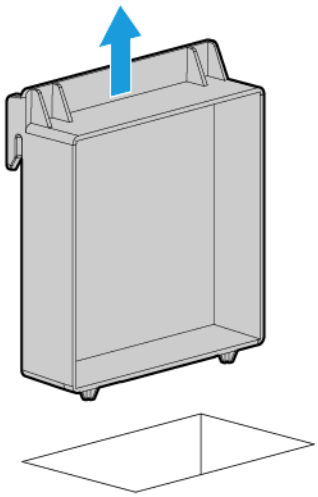


13. Install the heatsink:

a. Position the heatsink on the processor backplate.
b. Tighten one pair of diagonally opposite screws halfway, and then tighten the other pair of screws.
c. Finish the installation by completely tightening the screws in the same sequence.

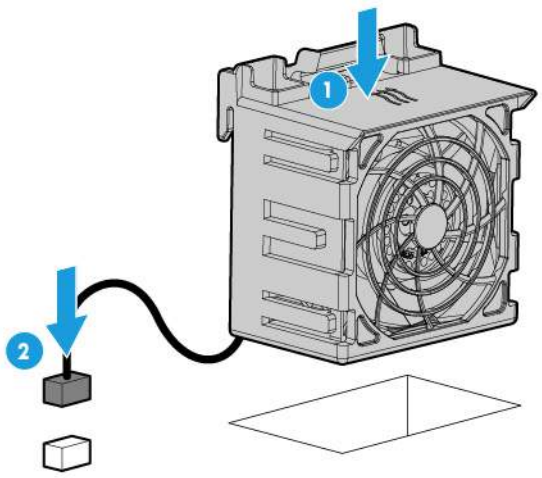


14. To determine which fan blanks need to be removed to install the additional fans, see "Fan population guidelines (on page 79)."
15. Remove the fan blank.



16. Install the fan.

17. Connect the fan cable to the system board.



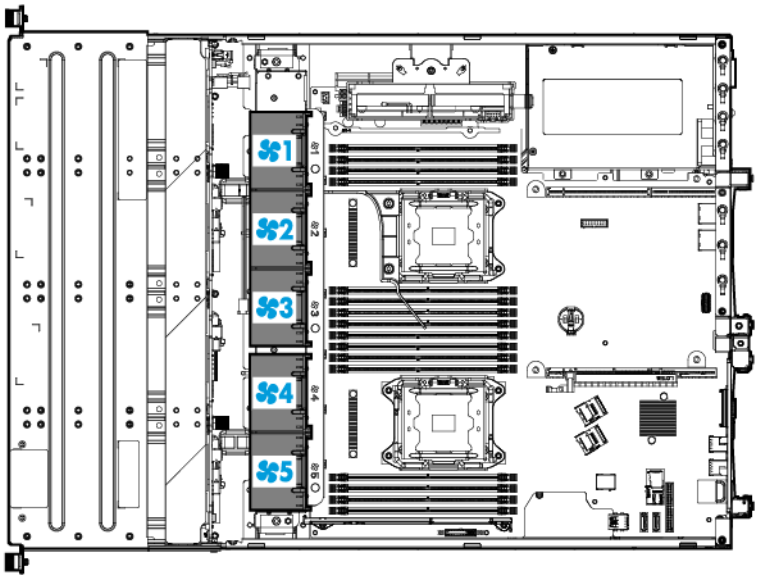
Store any unused fans as spares.

18. Install the air baffle (on page 30).
19. If removed, install the PCI riser cage ("Install the PCI riser cages" on page 26).
20. Install the access panel (on page 25).
21. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
22. Power up the server (on page 20).

Redundant fan option

To provide sufficient airflow to the system if a primary fan fails, the server supports redundant fans.

Fan population guidelines



Configuration	Fan bay 1	Fan bay 2	Fan bay 3	Fan bay 4	Fan bay 5
One processor, non-redundant	Blank	Fan	Blank	Blank	Fan
One processor, redundant	Blank	Fan	Fan	Fan	Fan
Two processors, non-redundant	Fan	Fan	Blank	Fan	Fan
Two processors, redundant	Fan	Fan	Fan	Fan	Fan

- In a redundant fan mode:
  - If one fan fails, the system continues to operate without redundancy. This condition is indicated by a flashing amber Health LED.
  - If two fans fail, the system shuts down.
- The minimum fan requirement to make this server bootable is:
  - Two fans (fans 2 and 5) for a single processor configuration
  - Four fans (fans 1, 2, 4, and 5) for dual processor configuration

Installing the fan option

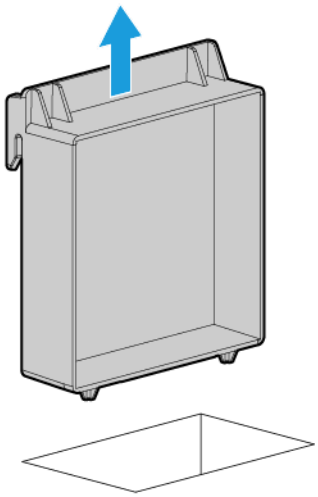
⚠ **WARNING:** To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

To install the component:

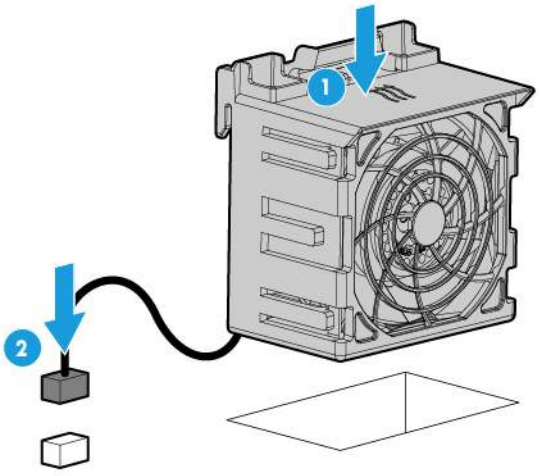
1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).

- Remove the server from the rack (on page 22).

4. Remove the access panel (on page 24).
5. Remove the air baffle (on page 27).
6. To determine which fan blanks need to be removed to install the additional fans, see "Fan population guidelines (on page 79)."
7. Remove the fan blank.



8. Install the fan.
9. Connect the fan cable to the system board.



10. If removed, install the PCI riser cage ("Install the PCI riser cages" on page 26).
11. Install the air baffle (on page 30).
12. Install the access panel (on page 25).
13. Do one of the following:
    - Slide the server into the rack.

- Install the server into the rack ("Installing the server into the rack" on page 36).

14. Power up the server (on page 20).

Memory options

IMPORTANT: This server does not support mixing LRDIMMs and RDIMMs. Attempting to mix any combination of these DIMMs can cause the server to halt during BIOS initialization.

The memory subsystem in this server can support LRDIMMs or RDIMMs:

- RDIMMs offer address parity protection.
- LRDIMMs support higher densities than single-rank and dual-rank RDIMMs. This support enables you to install more high capacity DIMMs, resulting in higher system capacities and higher bandwidth.

All types are referred to as DIMMs when the information applies to all types. When specified as LRDIMM or RDIMM, the information applies to that type only. All memory installed in the server must be of the same type.

The server supports the following DIMM speeds:

- Single-rank and dual-rank PC4-2133 (DDR4-2133) RDIMMs operating at up to 2133 MT/s
- Dual-rank and quad-rank PC4-2133 (DDR4-2133) LRDIMMs operating at up to 2133 MT/s

Depending on the processor model, the number of DIMMs installed, and whether LRDIMMs or RDIMMs are installed, the memory clock speed might be reduced to 1600 MT/s.

Supported DIMM specifications

Type	Rank	Capacity	Native speed	Voltage
RDIMM	Single	8 GB	2133 MT/s	STD
RDIMM	Dual	16 GB	2133 MT/s	STD
LRDIMM	Quad	32 GB	2133 MT/s	STD

Populated DIMM speed (MT/s)

Type	Rank	1 DIMM per channel	2 DIMMs per channel
RDIMM	Single	2133 MT/s	2133 MT/s
RDIMM	Dual	2133 MT/s	2133 MT/s
LRDIMM	Quad	2133 MT/s	2133 MT/s

HP SmartMemory

HP SmartMemory authenticates and unlocks certain features available only on HP Qualified memory and verifies whether installed memory has passed HP qualification and test processes. Qualified memory is performance-tuned for HP ProLiant and BladeSystem servers and provides future enhanced support through HP Active Health and manageability software.

Memory subsystem architecture

The memory subsystem in this server is divided into channels. Each processor supports four channels, and each channel supports two DIMM slots.

Channel	Population order	Slot number
1	A E	8 7
2	B F	6 5
3	C G	1 2
4	D H	3 4

For the location of the slot numbers, see "DIMM slot locations (on page 14)."

This multi-channel architecture provides enhanced performance in Advanced ECC mode. This architecture also enables Online Spare Memory mode.

DIMM slots in this server are identified by number and by letter. Letters identify the population order. Slot numbers indicate the DIMM slot ID for spare replacement.

Single-, dual-, and quad-rank DIMMs

To understand and configure memory protection modes properly, an understanding of single-, dual-, and quad-rank DIMMs is helpful. Some DIMM configuration requirements are based on these classifications.

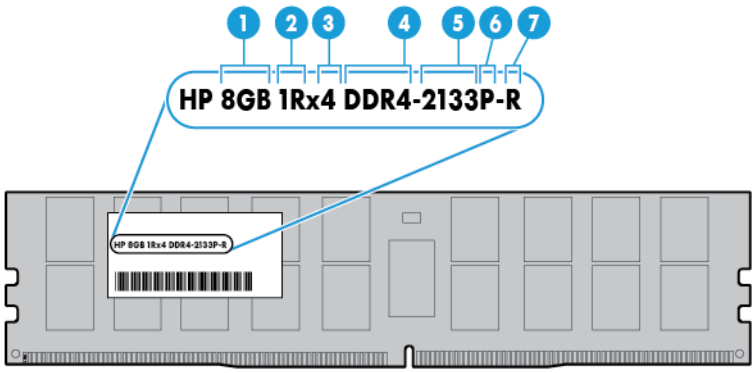
A single-rank DIMM has one set of memory chips that is accessed while writing to or reading from the memory. A dual-rank DIMM is similar to having two single-rank DIMMs on the same module, with only one rank accessible at a time. A quad-rank DIMM is, effectively, two dual-rank DIMMs on the same module. Only one rank is accessible at a time. The server memory control subsystem selects the proper rank within the DIMM when writing to or reading from the DIMM.

Dual- and quad-rank DIMMs provide the greatest capacity with the existing memory technology. For example, if current DRAM technology supports 8-GB single-rank DIMMs, a dual-rank DIMM would be 16 GB, and a quad-rank DIMM would be 32 GB.

LRDIMMs are labeled as quad-rank DIMMs. There are four ranks of DRAM on the DIMM, but the LRDIMM buffer creates an abstraction that allows the DIMM to appear as a dual-rank DIMM to the system. The LRDIMM buffer isolates the electrical loading of the DRAM from the system to allow for faster operation. This allows higher memory operating speed compared to quad-rank RDIMMs.

DIMM identification

To determine DIMM characteristics, use the label attached to the DIMM and the following illustration and table.



Item	Description	Definition
1	Capacity	8 GB 16 GB 32 GB
2	Rank	1R = Single-rank 2R = Dual-rank 4R = Quad-rank
3	Data width	x4 = 4-bit x8 = 8-bit
4	Memory generation	DDR4
5	Maximum memory speed	2133 MT/s
6	CAS latency	P=15
7	DIMM type	R = RDIMM (registered) L = LRDIMM (load reduced)

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

Memory configurations

To optimize server availability, the server supports the following AMP modes:

- Advanced ECC—Provides up to 4-bit error correction and enhanced performance over Lockstep mode. This mode is the default option for this server.
- Online spare memory—Provides protection against failing or degraded DIMMs. Certain memory is reserved as spare, and automatic failover to spare memory occurs when the system detects a DIMM that is degrading. This allows DIMMs that have a higher probability of receiving an uncorrectable memory error (which would result in system downtime) to be removed from operation.

Advanced Memory Protection options are configured in the BIOS/Platform Configuration (RBSU). If the requested AMP mode is not supported by the installed DIMM configuration, the server boots in Advanced ECC mode. For more information, see the *HP UEFI System Utilities User Guide for HP ProLiant Gen9 Servers* on the HP website (http://www.hp.com/go/uefi/docs).

Maximum capacity

DIMM type	DIMM rank	One processor	Two processors
RDIMM	Single-rank (8 GB)	64 GB	128 GB
RDIMM	Dual-rank (16 GB)	128 GB	256 GB
LRDIMM	Quad-rank (32 GB)	256 GB	512 GB

For the latest memory configuration information, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

Advanced ECC memory configuration

Advanced ECC memory is the default memory protection mode for this server. Standard ECC can correct single-bit memory errors and detect multi-bit memory errors. When multi-bit errors are detected using Standard ECC, the error is signaled to the server and causes the server to halt.

Advanced ECC protects the server against some multi-bit memory errors. Advanced ECC can correct both single-bit memory errors and 4-bit memory errors if all failed bits are on the same DRAM device on the DIMM.

Advanced ECC provides additional protection over Standard ECC because it is possible to correct certain memory errors that would otherwise be uncorrected and result in a server failure. Using HP Advanced Memory Error Detection technology, the server provides notification when a DIMM is degrading and has a higher probability of uncorrectable memory error.

Online Spare memory configuration

Online spare memory provides protection against degraded DIMMs by reducing the likelihood of uncorrected memory errors. This protection is available without any operating system support.

Online spare memory protection dedicates one rank of each memory channel for use as spare memory. The remaining ranks are available for OS and application use. If correctable memory errors occur at a rate higher than a specific threshold on any of the non-spare ranks, the server automatically copies the memory contents of the degraded rank to the online spare rank. The server then deactivates the failing rank and automatically switches over to the online spare rank.

General DIMM slot population guidelines

Observe the following guidelines for all AMP modes:

- Install DIMMs only if the corresponding processor is installed.
- Do not mix LRDIMMs and RDIMMs.
- White DIMM slots denote the first slot of a channel (Ch 1-A, Ch 2-B, Ch 3-C, Ch 4-D).
- When only one processor is installed, install DIMMs in sequential alphabetic order: A, B, C, D, E, F, and so forth.
- When two processors are installed, install the DIMMs in sequential alphabetical order balanced between the two processors: P1-A, P2-A, P1-B, P2-B, P1-C, P2-C, and so forth.

- When single-rank, dual-rank, and quad-rank DIMMs are populated for two DIMMs per channel, always populate the higher number rank DIMM first (starting from the farthest slot). For example, first quad-rank DIMM, then dual-rank DIMM, and then lastly single-rank DIMM.
- DIMMs should be populated starting farthest from the processor on each channel.

For more information about server memory, see the HP website (http://www.hp.com/go/memory).

The DIMM speeds supported in this server are listed in the following table:

Populated slots (per channel)	Rank	Speeds supported (MT/s)
1	Single, dual, or quad-rank	2133
2	Single, dual, or quad-rank	2133

Advanced ECC population guidelines

For Advanced ECC mode configurations, observe the following guidelines:

- Observe the general DIMM slot population guidelines (on page 84).
- DIMMs may be installed individually.

Online spare population guidelines

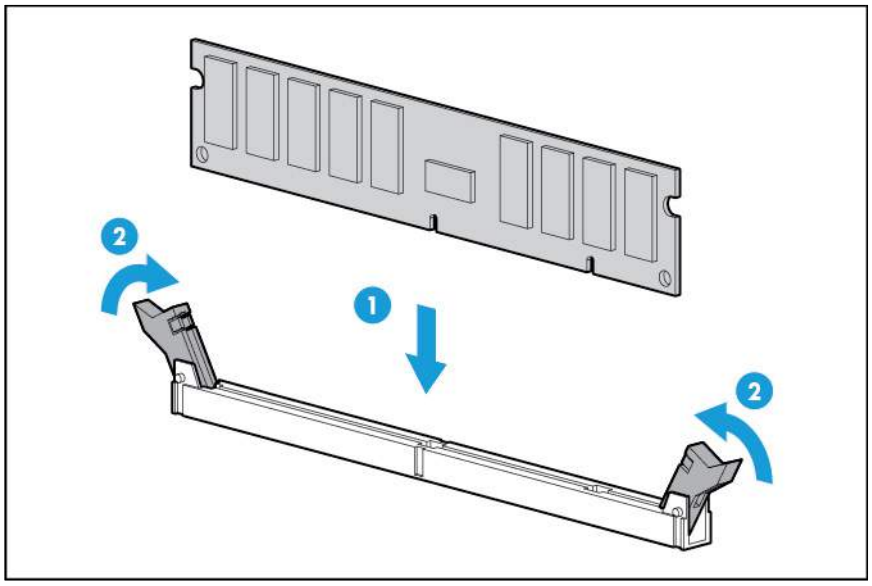
For Online Spare memory mode configurations, observe the following guidelines:

- Observe the general DIMM slot population guidelines (on page 84).
- Each channel must have a valid online spare configuration.
- Each channel can have a different valid online spare configuration.
- Each populated channel must have a spare rank. A single dual-rank DIMM is not a valid configuration.

Installing a DIMM

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. Remove the air baffle (on page 27).
6. Open the DIMM slot latches.

7. Install the DIMM.



8. Install the air baffle (on page 30).
9. Install the access panel (on page 25).
10. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
11. Power up the server (on page 20).

After installing the DIMMs, use BIOS/Platform Configuration (RBSU) in the UEFI System Utilities ("HP UEFI System Utilities" on page 113) to configure the memory protection mode.

PCI riser cage assembly options

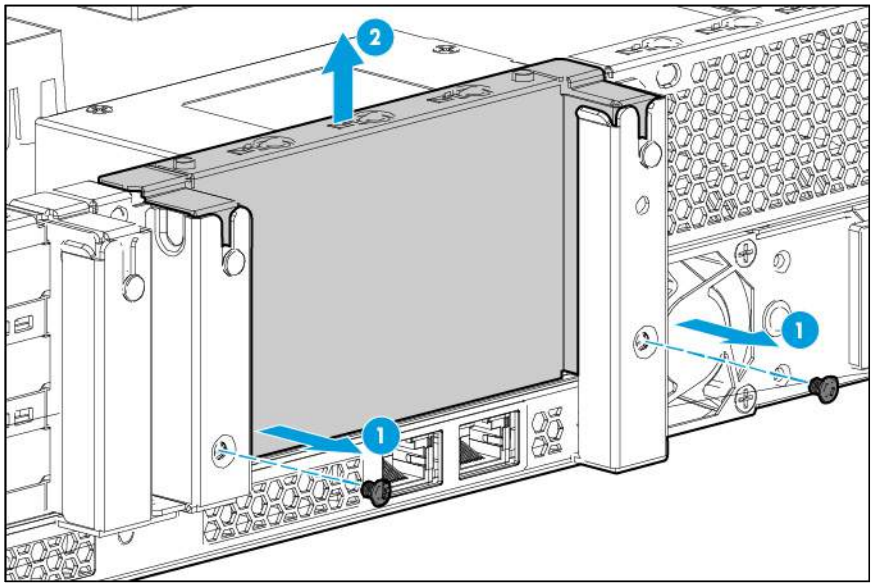
The server supports two PCI riser cage assembly options. Both PCI riser cage assembly options can be installed in either the primary or the secondary PCIe riser location. For instructions on how to install these options, see "PCI riser cage assembly options (on page 86)." A second processor is required to support installation in the secondary PCIe riser location. For more information on the riser board slot specifications, see "PCIe riser board slot definitions (on page 12)."

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

To install the component:

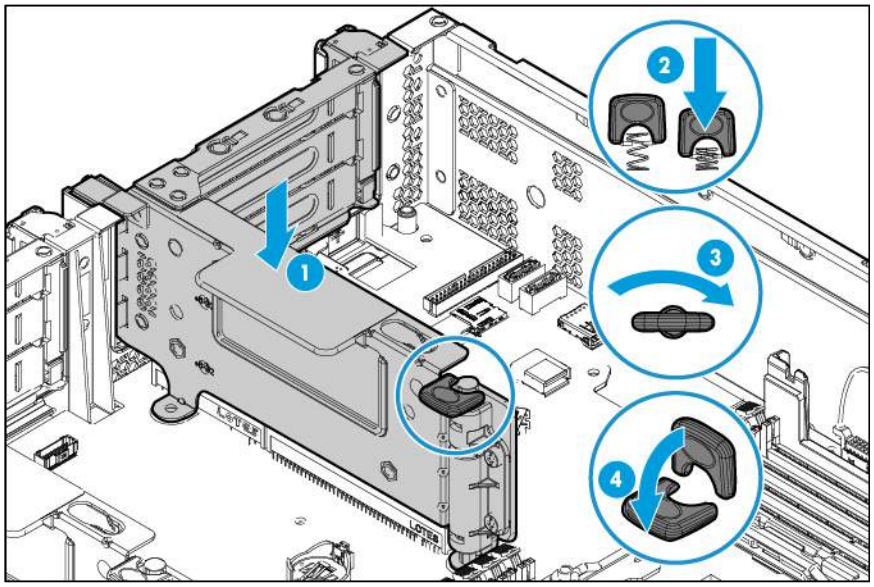
1. Power down the server (on page 20).
2. Remove all power:
    a. Disconnect each power cord from the power source.
    b. Disconnect each power cord from the server.
3. Do one of the following:
    - Extend the server from the rack (on page 20).
    - Remove the server from the rack (on page 22).

4. Remove the access panel (on page 24).
5. If you are installing this PCI riser cage assembly option in the primary PCIe riser location, remove the default primary PCI riser cage ("Remove the PCI riser cages" on page 25).
6. If you are installing this PCI riser cage assembly option in the secondary PCI riser location, then remove the secondary PCI riser blank.

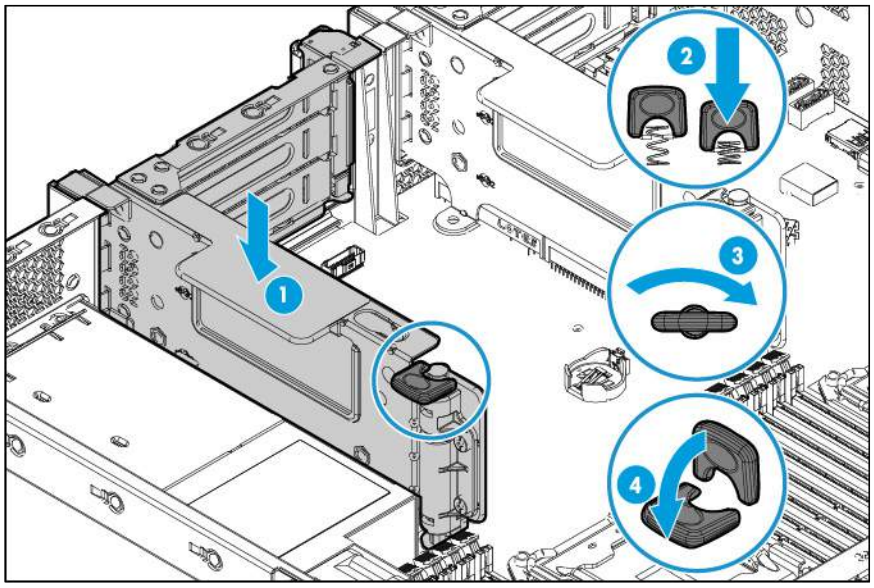


Retain the blank for future use.

7. Align the PCI riser board with the corresponding connector on the system board, and then press down the riser cage.
8. Push down the release tab, and then rotate it 180° clockwise.
   - PCI riser cage assembly installed in the primary PCI riser location



- PCI riser cage assembly installed in the secondary PCI riser location



△ **CAUTION:** To prevent improper cooling and thermal damage, do not operate the server unless all PCI slots have either an expansion slot cover or an expansion board installed.

9. Install the access panel (on page 25).
10. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
11. Power up the server (on page 20).

Expansion board options

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

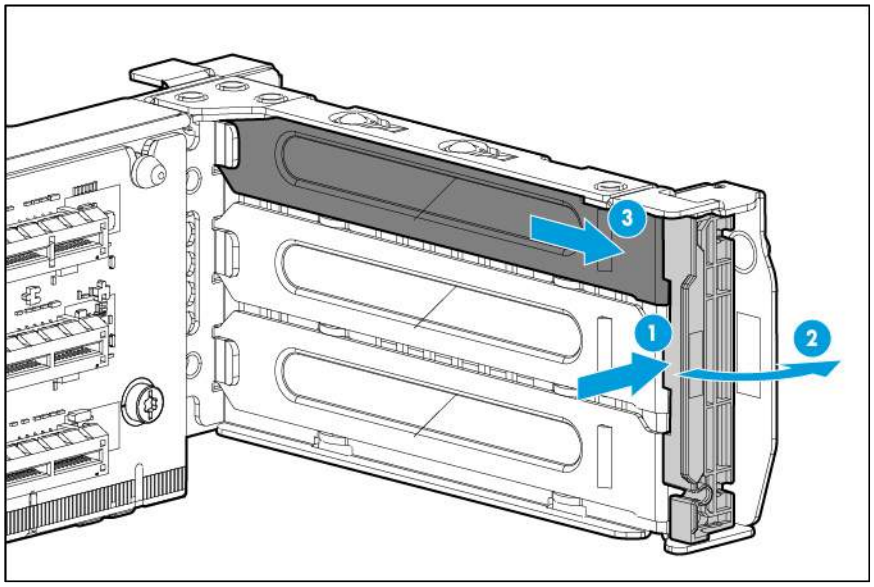
△ **CAUTION:** To prevent damage to the server or expansion boards, power down the server, and disconnect all power cords before removing or installing the PCI riser cage.

△ **CAUTION:** To prevent improper cooling and thermal damage, do not operate the server unless all expansion slots have either an expansion slot cover or an expansion board installed.

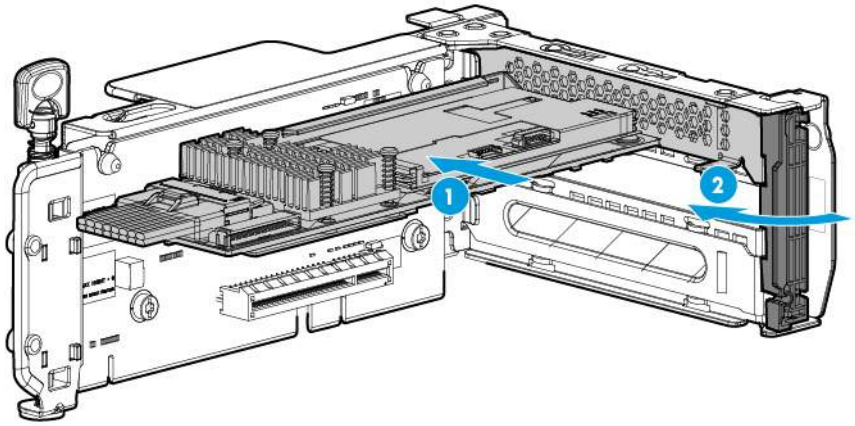
To install the component:

1. Power down the server (on page 20).
2. Remove all power:
    a. Disconnect each power cord from the power source.
    b. Disconnect each power cord from the server.
3. Do one of the following:
    - Extend the server from the rack (on page 20).
    - Remove the server from the rack (on page 22).

4. Remove the access panel (on page 24).
5. Remove the PCI riser cage ("Remove the PCI riser cages" on page 25).
6. Identify the expansion slot compatible with the new option, and then remove the cover opposite that slot.



7. Verify that any switches or jumpers on the expansion board are set properly. For more information, see the documentation that ships with the option.
8. Install the expansion board.



9. Install the PCI riser cage ("Install the PCI riser cages" on page 26).
10. Connect all necessary internal cabling to the expansion board. For more information on these cabling requirements, see the documentation that ships with the option.
11. Install the access panel (on page 25).
12. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
13. Connect all necessary external cabling to the expansion board. For more information on these cabling requirements, see the documentation that ships with the option.

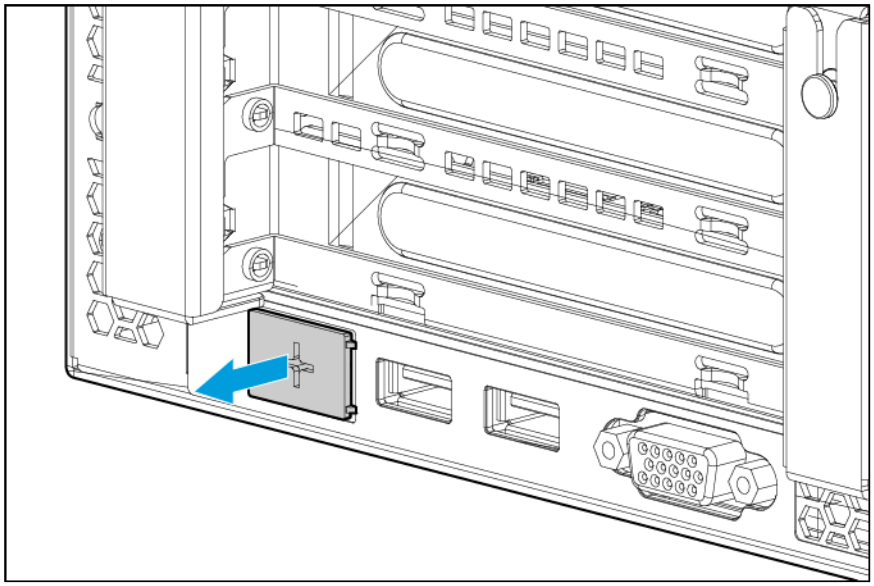
14. Power up the server (on page 20).

Dedicated iLO management module option

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

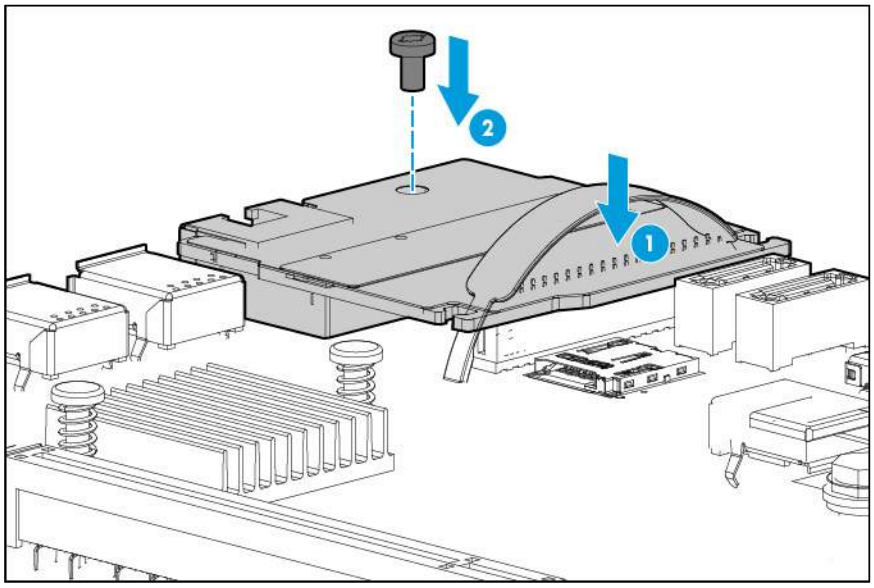
To install the component:

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. Access the rear panel ("Access the product rear panel" on page 23).
6. Using a flat screwdriver, toggle the knockout to loosen it, and then pull it out of the chassis.



7. If an expansion board is installed in the primary PCI riser cage, remove the board.

8. Install the dedicated iLO management module.



9. If removed, install the expansion board.
10. Install the access panel (on page 25).
11. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
12. Power up the server (on page 20).
13. Enable the dedicated iLO connector ("Dedicated iLO management module option" on page 90).

Enabling the dedicated iLO management module

The onboard NIC 1/shared iLO connector is set as the default system iLO connector. To enable the installed, dedicated iLO management module in a server operating in:

- Legacy BIOS Boot Mode, use the iLO RBSU.

  For more information on this utility, see the *HP iLO 4 User Guide* in the HP website (http://www.hp.com/go/ilo/docs).

- UEFI Boot Mode, use the iLO 4 Configuration Utility.

  For more information on this utility, see the *HP UEFI System Utilities User Guide for HP ProLiant Gen9 Servers* on the HP website (http://www.hp.com/go/uefi/docs).

IMPORTANT: If the iLO configuration settings are reset to the default values, remote access to the machine will be lost. Access the physical machine and repeat the procedure described in this section to re-enable the dedicated iLO management connector.

To enable the dedicated iLO management module in Legacy BIOS Boot Mode:

1. During the server startup sequence after module installation, press **F8** in the POST screen.

   The iLO RBSU screen appears.
2. Select **Network** | **NIC and TCP/IP**.

   The Network Configuration screen appears.

3. Select **Network Interface Adapter**, and then press **Enter**.
4. Select **ON**.
5. Press **F10** followed by **Y** to save your changes.
6. Select **File** | **Exit** to exit the utility and resume the boot process.

To enable the dedicated iLO management module in UEFI BIOS mode:

1. During the server startup sequence after module installation, press **F9** in the POST screen.

   The System Utilities screen appears.
2. Select **System Configuration** | **iLO 4 Configuration Utility**.

   The iLO 4 Configuration Utility screen appears.
3. Select **Network Interface Adapter**, and then press **Enter**.
4. Select **ON**.
5. Press **F10** to save your changes.
6. Press **Esc** until the main menu is displayed.
7. Select **Exit and Resume Boot** in the main menu, and then press **Enter**.
8. When prompted to confirm the request, press **Enter** to exit the utility and resume the boot process.

HP Trusted Platform Module option

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

Use these instructions to install and enable a TPM on a supported server. This procedure includes three sections:

1. Installing the Trusted Platform Module board (on page 93).
2. Retaining the recovery key/password (on page 94).
3. Enabling the Trusted Platform Module (on page 94).

   Enabling the TPM requires accessing BIOS/Platform Configuration (RBSU) in HP UEFI System Utilities (on page 113).

TPM installation requires the use of drive encryption technology, such as the Microsoft Windows BitLocker Drive Encryption feature. For more information on BitLocker, see the Microsoft website (http://www.microsoft.com).

△ **CAUTION:** Always observe the guidelines in this document. Failure to follow these guidelines can cause hardware damage or halt data access.

When installing or replacing a TPM, observe the following guidelines:

- Do not remove an installed TPM. Once installed, the TPM becomes a permanent part of the system board.
- When installing or replacing hardware, HP service providers cannot enable the TPM or the encryption technology. For security reasons, only the customer can enable these features.
- When returning a system board for service replacement, do not remove the TPM from the system board. When requested, HP Service provides a TPM with the spare system board.

- Any attempt to remove an installed TPM from the system board breaks or disfigures the TPM security rivet. Upon locating a broken or disfigured rivet on an installed TPM, administrators should consider the system compromised and take appropriate measures to ensure the integrity of the system data.
- When using BitLocker, always retain the recovery key/password. The recovery key/password is required to enter Recovery Mode after BitLocker detects a possible compromise of system integrity.
- HP is not liable for blocked data access caused by improper TPM use. For operating instructions, see the encryption technology feature documentation provided by the operating system.

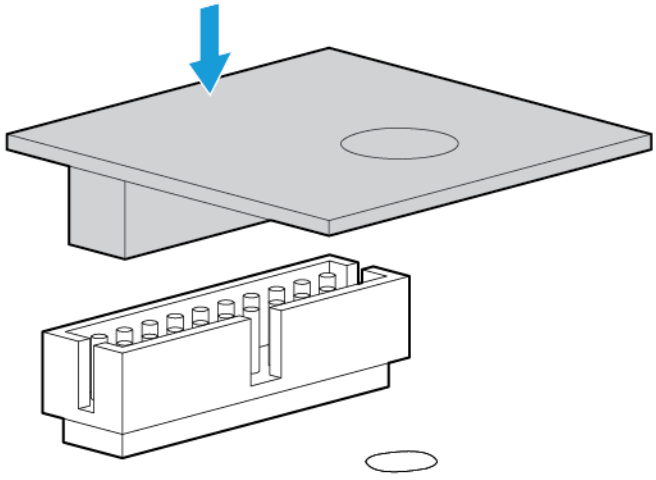
Installing the Trusted Platform Module board

⚠ **WARNING:** To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

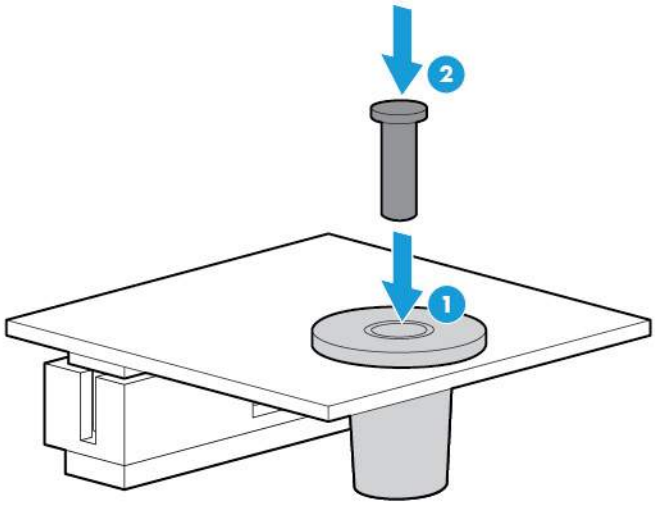
1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. If an expansion board is installed in the secondary PCI riser location, remove the board.

△ **CAUTION:** Any attempt to remove an installed TPM from the system board breaks or disfigures the TPM security rivet. Upon locating a broken or disfigured rivet on an installed TPM, administrators should consider the system compromised and take appropriate measures to ensure the integrity of the system data.

6. Install the TPM board. Press down on the connector to seat the board ("System board components" on page 13).



7. Install the TPM security rivet by pressing the rivet firmly into the system board.



8. If removed, install the expansion board.
9. Install the access panel (on page 25).
10. Do one of the following:
    - Slide the server into the rack.
    - Install the server into the rack ("Installing the server into the rack" on page 36).
11. Power up the server (on page 20).

Retaining the recovery key/password

The recovery key/password is generated during BitLocker setup, and can be saved and printed after BitLocker is enabled. When using BitLocker, always retain the recovery key/password. The recovery key/password is required to enter Recovery Mode after BitLocker detects a possible compromise of system integrity.

To help ensure maximum security, observe the following guidelines when retaining the recovery key/password:

- Always store the recovery key/password in multiple locations.
- Always store copies of the recovery key/password away from the server.
- Do not save the recovery key/password on the encrypted hard drive.

Enabling the Trusted Platform Module

1. During the server startup sequence, press the **F9** key to access System Utilities.
2. From the System Utilities screen, select **System Configuration** > **BIOS/Platform Configuration (RBSU)** > **Server Security**.
3. Select **Trusted Platform Module Options** and press the **Enter** key.
4. Select **Enabled** to enable the TPM and BIOS secure startup. The TPM is fully functional in this mode.
5. Press the **F10** key to save your selection.

6. When prompted to save the change in System Utilities, press the **Y** key.
7. Press the **ESC** key to exit System Utilities. Then, press the **Enter** key when prompted to reboot the server.

The server then reboots a second time without user input. During this reboot, the TPM setting becomes effective.

You can now enable TPM functionality in the OS, such as Microsoft Window BitLocker or measured boot.

> △ **CAUTION:** When a TPM is installed and enabled on the server, data access is locked if you fail to follow the proper procedures for updating the system or option firmware, replacing the system board, replacing a hard drive, or modifying OS application TPM settings.

For more information on firmware updates and hardware procedures, see the *HP Trusted Platform Module Best Practices White Paper* on the HP website (http://www.hp.com/support).

For more information on adjusting TPM usage in BitLocker, see the Microsoft website (http://technet.microsoft.com/en-us/library/cc732774.aspx).

Cabling

Cabling overview

This section provides guidelines that help you make informed decisions about cabling the server and hardware options to optimize performance.

For information on cabling peripheral components, refer to the white paper on high-density deployment at the HP website (http://www.hp.com/products/servers/platforms).

△ **CAUTION:** When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.

Storage cabling

The storage cabling illustrations in this section show both the drive data and power cables.

The LFF and SFF drive models each has their own preinstalled 20-pin multi-output drive power cable.

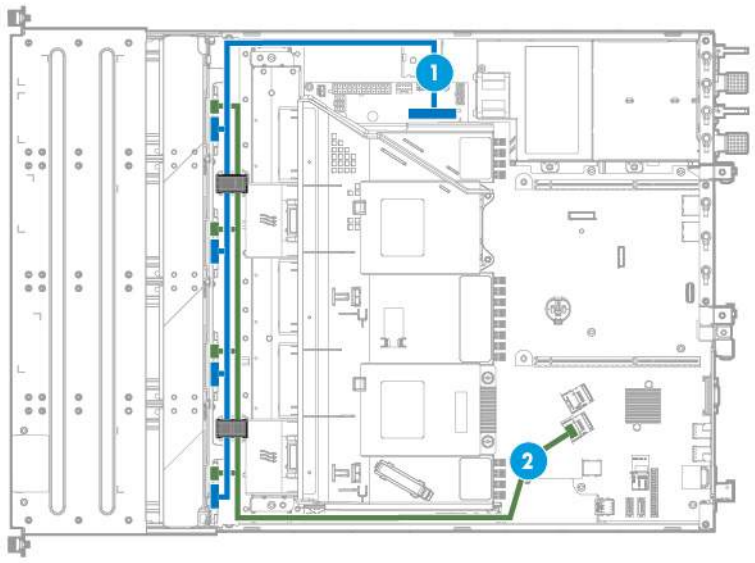
The LFF drive power cable has the following connections:

- Common end connector—System board
- BP1 cable connector—4-bay LFF backplane
- BP2 cable connector—8-bay LFF backplane

The SFF drive power cable has the following connections:

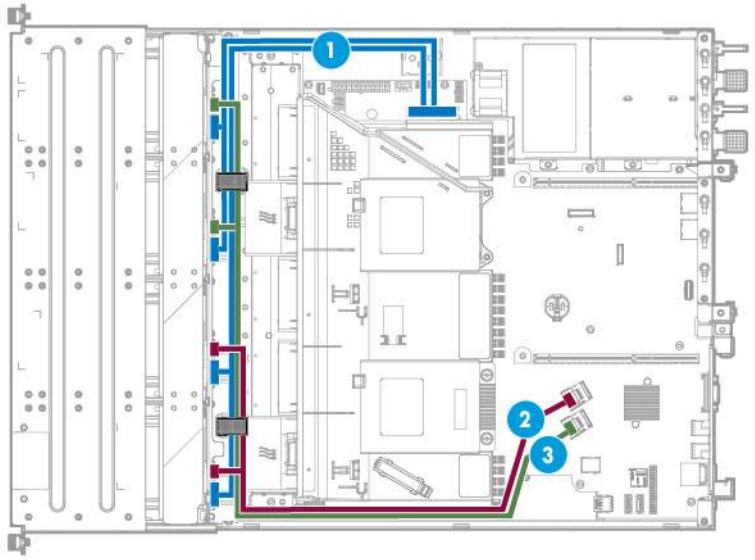
- Common end connector—System board
- BP3 cable connector—8-bay SFF backplane in box 3
- BP2 cable connector—8-bay SFF backplane in box 2 (16-bay SFF drive configuration)
- ODD cable connector—Power connector in the SATA optical drive cable (if an optical drive is installed)

4-bay LFF non-hot-plug SATA drive cabling



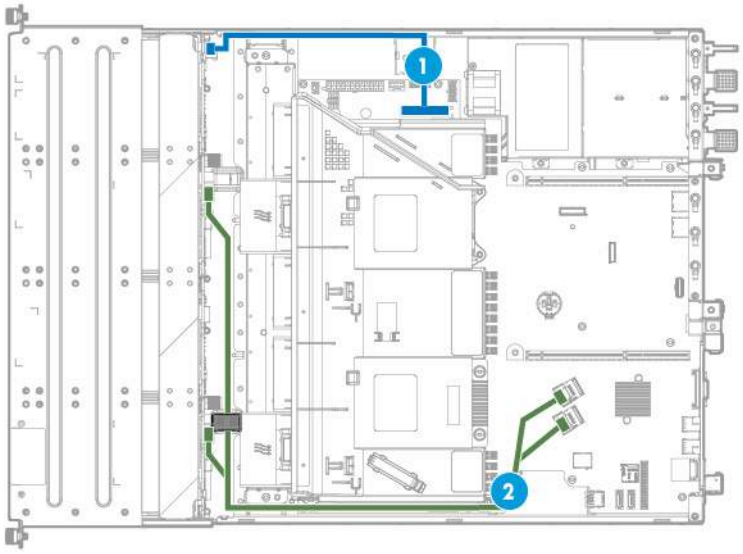
Item	Description
1	Drive power cable
2	Mini-SAS cable

8-bay LFF non-hot-plug SATA drive cabling



Item	Description
1	Drive power cable
2	Mini-SAS cable 2
3	Mini-SAS cable 1

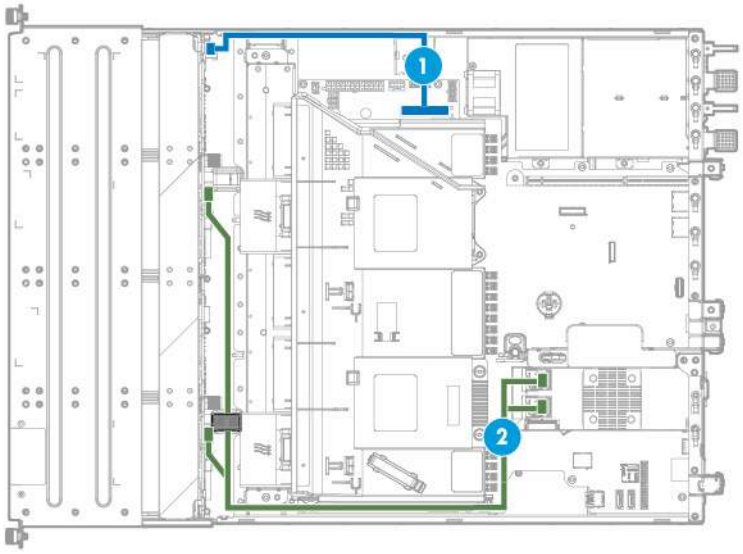
8-bay LFF hot-plug SATA drive cabling



Item	Description
1	Drive power cable
2	Mini-SAS X-cable

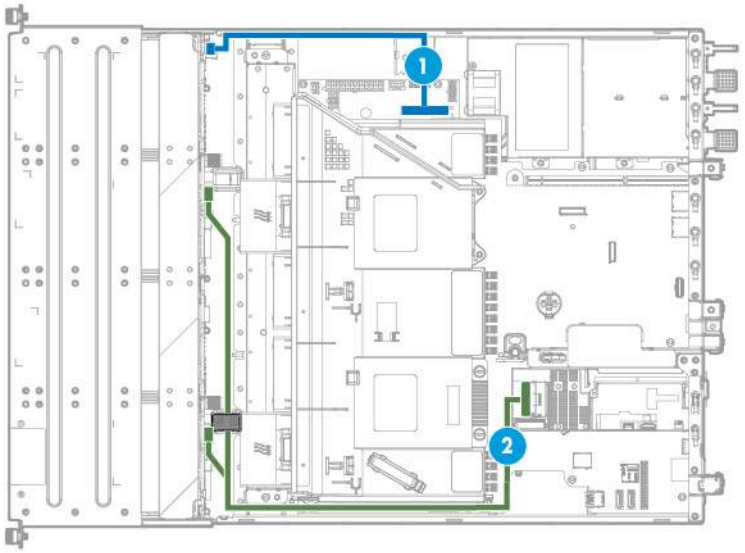
8-bay LFF hot-plug SAS/SATA drive cabling

- Drives connected to an HBA option



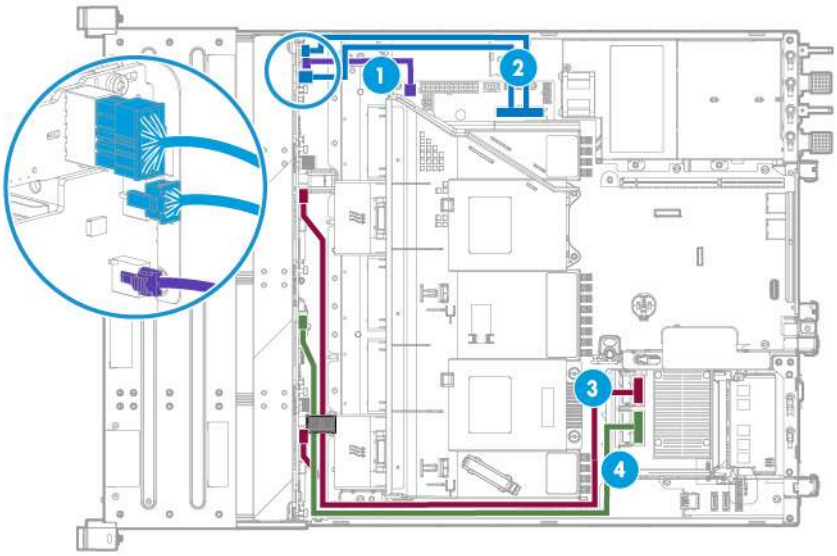
Item	Description
1	Drive power cable
2	Mini-SAS X-cable

- Drives connected to an HP Smart Array Controller option



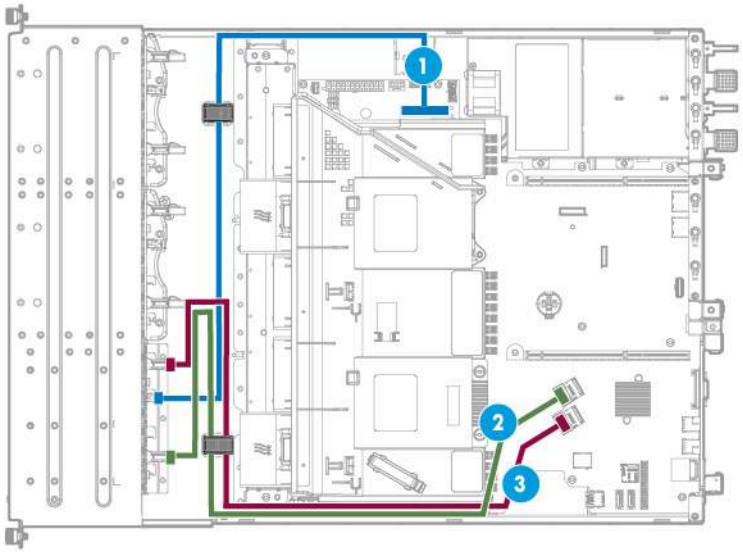
Item	Description
1	Drive power cable
2	Mini SAS Y-cable

12-bay LFF hot-plug SAS/SATA drive cabling



Item	Description
1	12-bay LFF drive identification signal cable
2	Drive power cable
3	Mini-SAS cable to the box 1 drives (4-bay LFF backplane)
4	Mini-SAS Y-cable to the box 2 drives (8-bay LFF backplane)

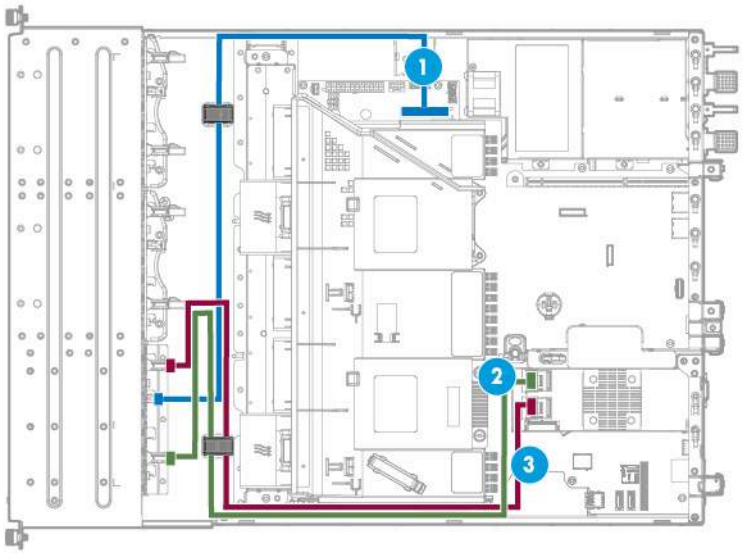
8-bay SFF hot-plug SATA drive cabling



Item	Description
1	Drive power cable
2	Mini-SAS cable 2
3	Mini-SAS cable 1

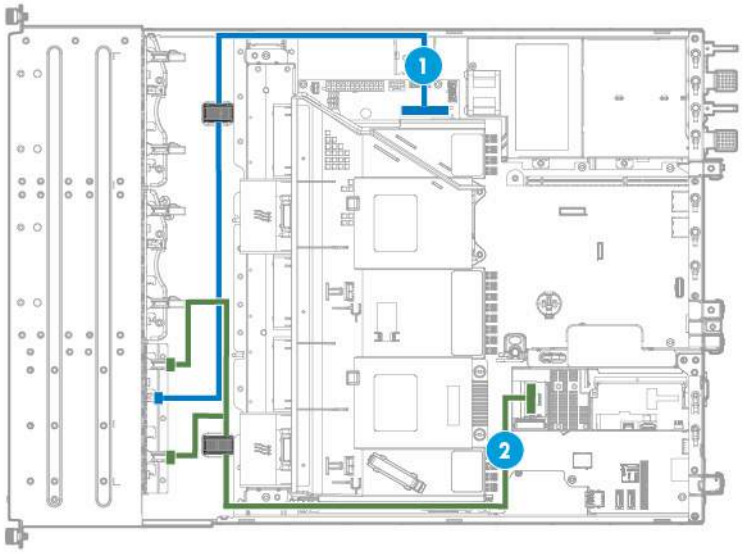
8-bay SFF hot-plug SAS/SATA drive cabling

- Drives connected to an HBA option



Item	Description
1	Drive power cable
2	Mini-SAS cable 2
3	Mini-SAS cable 1

- Drives connected to an HP Smart Array Controller option

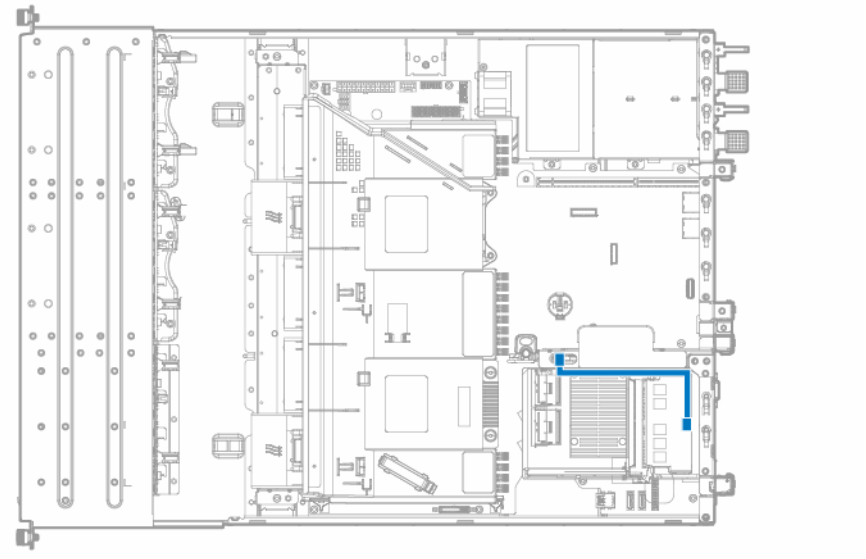


Item	Description
1	Drive power cable
2	Mini-SAS Y-cable

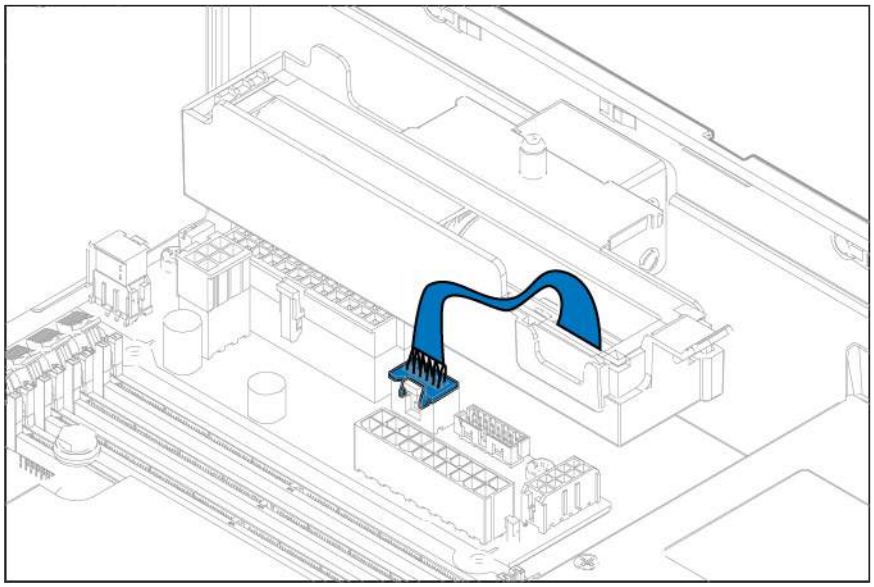
FBWC module cabling

The FBWC solution is a separately purchased option. This server only supports FBWC module installation when an HP Smart Array P-Series controller is installed.

Depending on the controller option installed, the actual storage controller connectors might look different from what is shown in this section.



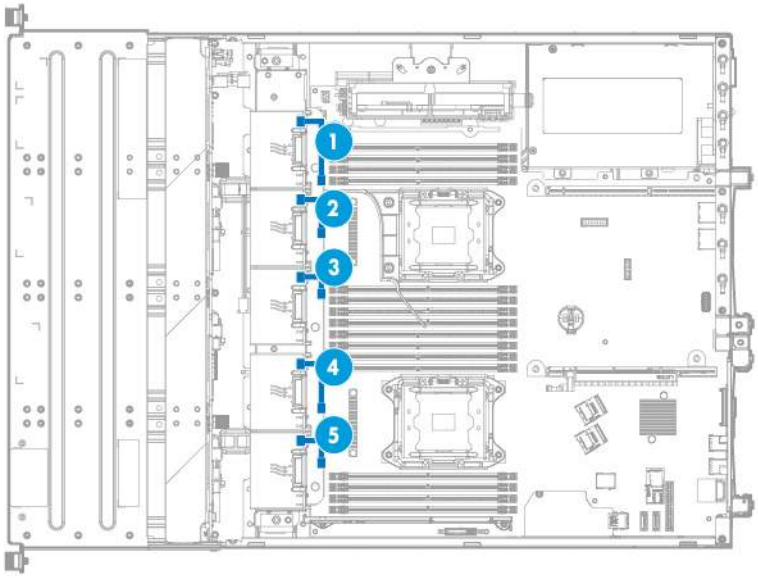
HP Smart Storage Battery cabling



Optical drive cabling

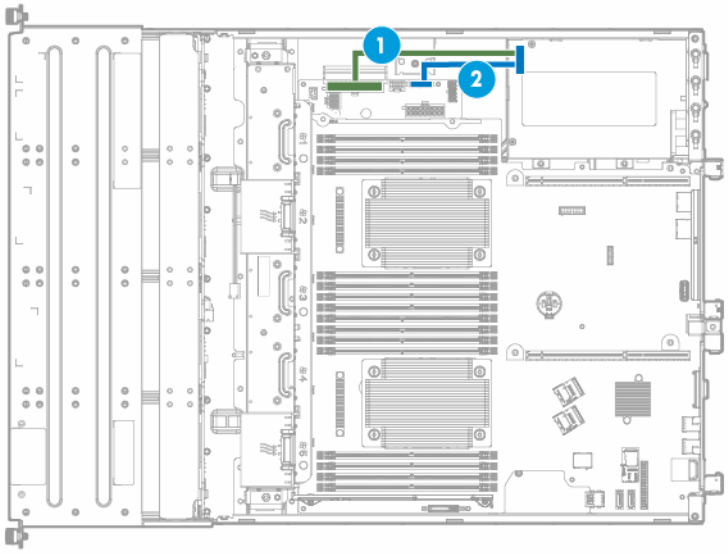
Item	Description
1	Optical drive power cable
2	Optical drive SATA cable

Fan cabling



Item	Description
1	Fan 1 cable
2	Fan 2 cable
3	Fan 3 cable
4	Fan 4 cable
5	Fan 5 cable

HP 550-W Power Supply cabling (non-hot-plug)

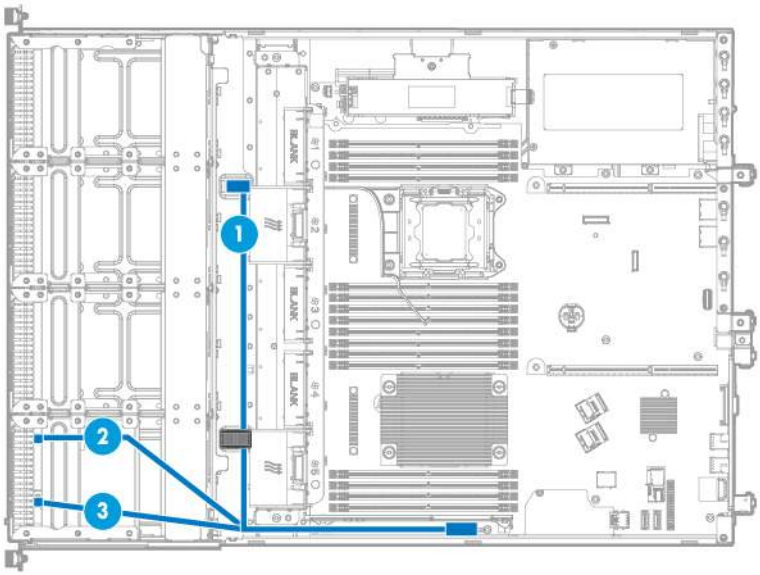


Item	Description
1	24-pin power supply cable

Item	Description
2	16-pin power supply sideband signal cable

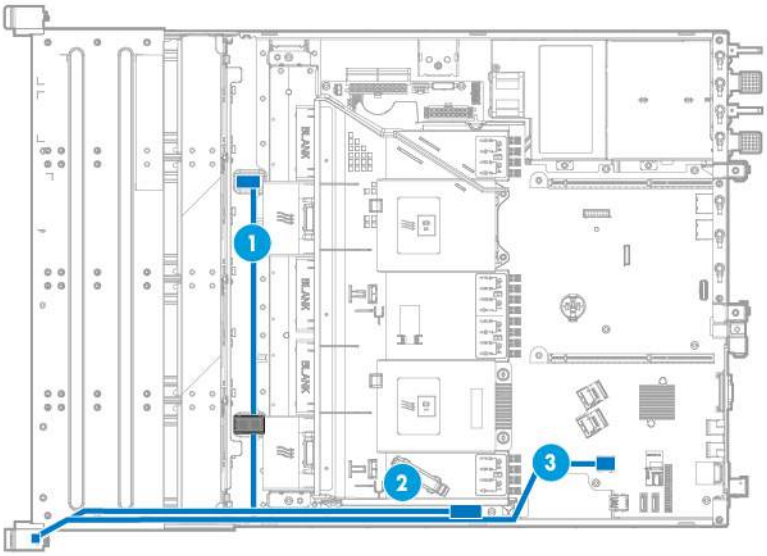
Front panel cabling

- Front panel cabling in an LFF chassis with thumbscrew rack ears



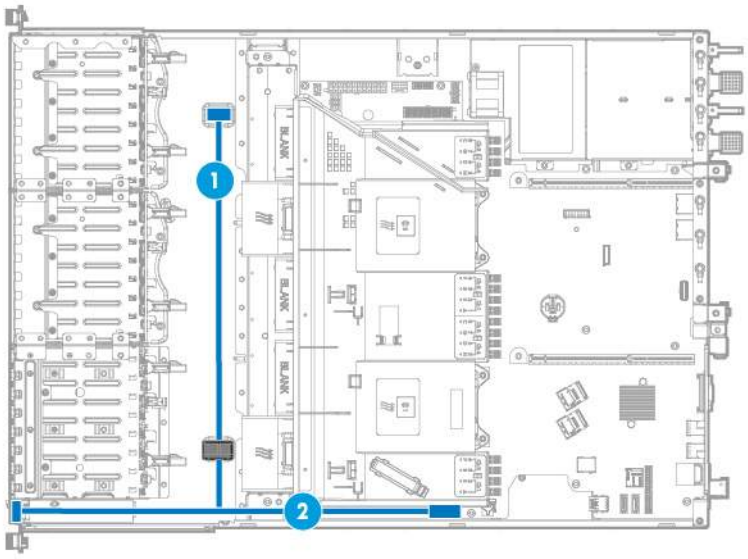
Item	Description
1	Ambient temperature sensor cable
2	USB 2.0 connector cable
3	Front I/O cable

- Front panel cabling in an LFF chassis with quick-release latch rack ears



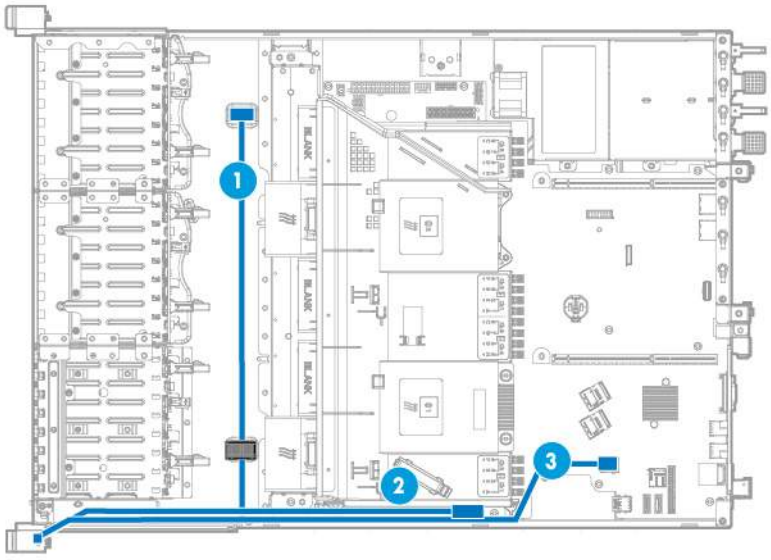
Item	Description
1	Ambient temperature sensor cable
2	Front I/O cable
3	USB 3.0 connector cable

- Front panel cabling in an SFF chassis with thumbscrew rack ears



Item	Description
1	Ambient temperature sensor cable
2	USB 2.0 connector cable

- Front panel cabling in an SFF chassis with quick-release latch rack ears



Item	Description
1	Ambient temperature sensor cable
2	Front I/O cable

Item	Description
3	USB 3.0 connector cable

Software and configuration utilities

Server mode

The software and configuration utilities presented in this section operate in online mode, offline mode, or in both modes.

Software or configuration utility	Server mode
HP iLO (on page 107)	Online and Offline
Active Health System (on page 108)	Online and Offline
HP RESTful API ("HP RESTful API support for HP iLO" on page 109)	Online and Offline
Integrated Management Log (on page 109)	Online and Offline
Intelligent Provisioning (on page 110)	Offline
HP Insight Diagnostics (on page 111)	Online and Offline
HP Insight Remote Support (on page 110)	Online
HP Insight Online (on page 110)	Online
Erase Utility (on page 111)	Offline
Scripting Toolkit for Windows and Linux (on page 112)	Online
HP Service Pack for ProLiant (on page 112)	Online and Offline
HP Smart Update Manager (on page 112)	Online and Offline
HP UEFI System Utilities (on page 113)	Offline
HP Smart Storage Administrator (on page 116)	Online and Offline
ROMPaq utility (on page 116)	Offline

Product QuickSpecs

For more information about product features, specifications, options, configurations, and compatibility, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

HP iLO

The iLO 4 subsystem is a standard component of HP ProLiant servers that simplifies initial server setup, server health monitoring, power and thermal optimization, and remote server administration. The iLO 4 subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO 4 independent of the host server and its operating system.

iLO 4 enables and manages the Active Health System (on page 108) and also features Agentless Management. All key internal subsystems are monitored by iLO 4. If enabled, SNMP alerts are sent directly by iLO 4 regardless of the host operating system or even if no host operating system is installed.

Embedded remote support software is available on HP ProLiant Gen8 and later servers with iLO 4, regardless of the operating system software and without installing OS agents on the server.

Using iLO 4, you can do the following:

- Access a high-performance and secure Integrated Remote Console to the server from anywhere in the world if you have a network connection to the server.
- Use the shared .NET Integrated Remote Console to collaborate with up to four server administrators.
- Remotely mount high-performance Virtual Media devices to the server.
- Securely and remotely control the power state of the managed server.
- Implement true Agentless Management with SNMP alerts from HP iLO, regardless of the state of the host server.
- Download the Active Health System log.
- Register for HP Insight Remote Support.
- Use iLO Federation to manage multiple servers from one system running the iLO web interface.
- Use Virtual Power and Virtual Media from the GUI, the CLI, or the iLO scripting toolkit for many tasks, including the automation of deployment and provisioning.
- Control iLO by using a remote management tool.

For more information about iLO 4 features, see the iLO 4 documentation on the HP website (http://www.hp.com/go/ilo/docs).

The HP iLO 4 hardware and firmware features and functionality, such as NAND size and embedded user partition, vary depending on the server model. For a complete list of supported features and functionality, see the HP iLO 4 QuickSpecs on the HP website (http://h18000.www1.hp.com/products/quickspecs/14276_div/14276_div.pdf).

Active Health System

HP Active Health System provides the following features:

- Combined diagnostics tools/scanners
- Always on, continuous monitoring for increased stability and shorter downtimes
- Rich configuration history
- Health and service alerts
- Easy export and upload to Service and Support

The HP Active Health System monitors and records changes in the server hardware and system configuration. The Active Health System assists in diagnosing problems and delivering rapid resolution if server failures occur.

The Active Health System collects the following types of data:

- Server model
- Serial number
- Processor model and speed
- Storage capacity and speed
- Memory capacity and speed
- Firmware/BIOS

HP Active Health System does not collect information about Active Health System users' operations, finances, customers, employees, partners, or data center, such as IP addresses, host names, user names, and passwords. HP Active Health System does not parse or change operating system data from third-party error event log activities, such as content created or passed through by the operating system.

The data that is collected is managed according to the HP Data Privacy policy. For more information see the HP website (http://www.hp.com/go/privacy).

The Active Health System, in conjunction with the system monitoring provided by Agentless Management or SNMP Pass-thru, provides continuous monitoring of hardware and configuration changes, system status, and service alerts for various server components.

The Agentless Management Service is available in the SPP, which can be downloaded from the HP website (http://www.hp.com/go/spp/download). The Active Health System log can be downloaded manually from iLO 4 or HP Intelligent Provisioning and sent to HP.

For more information, see the following documents:

- *HP iLO User Guide* on the HP website (http://www.hp.com/go/ilo/docs)
- *HP Intelligent Provisioning User Guide* on the HP website (http://www.hp.com/go/intelligentprovisioning/docs)

HP RESTful API support for HP iLO

HP iLO 4 firmware version 2.00 and later includes the HP RESTful API. The HP RESTful API is a management interface that server management tools can use to perform configuration, inventory, and monitoring of an HP ProLiant server via iLO. A REST client sends HTTPS operations to the iLO web server to GET and PATCH JSON-formatted data, and to configure supported iLO and server settings, such as the UEFI BIOS settings.

HP iLO 4 supports the HP RESTful API with HP ProLiant Gen8 and later servers. For more information about the HP RESTful API, see the HP website (http://www.hp.com/support/restfulinterface/docs).

Integrated Management Log

The IML records hundreds of events and stores them in an easy-to-view form. The IML timestamps each event with 1-minute granularity.

You can view recorded events in the IML in several ways, including the following:

- From within HP SIM
- From within HP UEFI System Utilities (on page 113)
- From within the Embedded UEFI shell (on page 115)
- From within operating system-specific IML viewers:
  - For Windows: IML Viewer
  - For Linux: IML Viewer Application
- From within the iLO 4 web interface
- From within HP Insight Diagnostics (on page 111)

HP Insight Remote Support

HP strongly recommends that you register your device for remote support to enable enhanced delivery of your HP Warranty, HP Care Pack Service, or HP contractual support agreement. HP Insight Remote Support supplements your monitoring continuously to ensure maximum system availability by providing intelligent event diagnosis, and automatic, secure submission of hardware event notifications to HP, which will initiate a fast and accurate resolution, based on your product's service level. Notifications can be sent to your authorized HP Channel Partner for onsite service, if configured and available in your country.

For more information, see *HP Insight Remote Support and Insight Online Setup Guide for ProLiant Servers and BladeSystem c-Class Enclosures* on the HP website (http://www.hp.com/go/insightremotesupport/docs). HP Insight Remote Support is available as part of HP Warranty, HP Care Pack Service, or HP contractual support agreement.

HP Insight Remote Support central connect

When you use the embedded Remote Support functionality with HP ProLiant Gen8 and later server models and HP BladeSystem c-Class enclosures, you can register a server or enclosure to communicate to HP through an HP Insight Remote Support centralized Hosting Device in your local environment. All configuration and service event information is routed through the Hosting Device. This information can be viewed by using the local HP Insight Remote Support user interface or the web-based view in HP Insight Online.

For more information, see *HP Insight Remote Support Release Notes* on the HP website (http://www.hp.com/go/insightremotesupport/docs).

HP Insight Online direct connect

When you use the embedded Remote Support functionality with HP ProLiant Gen8 and later server models and HP BladeSystem c-Class enclosures, you can register a server or enclosure to communicate directly to HP Insight Online without the need to set up an HP Insight Remote Support centralized Hosting Device in your local environment. HP Insight Online will be your primary interface for remote support information.

For more information, see the product documentation on the HP website (http://www.hp.com/go/insightremotesupport/docs).

HP Insight Online

HP Insight Online is a capability of the HP Support Center portal. Combined with HP Insight Remote Support central connect or HP Insight Online direct connect, it automatically aggregates device health, asset, and support information with contract and warranty information, and then secures it in a single, personalized dashboard that is viewable from anywhere at any time. The dashboard organizes your IT and service data to help you understand and respond to that information more quickly. With specific authorization from you, an authorized HP Channel Partner can also view your IT environment remotely using HP Insight Online.

For more information about using HP Insight Online, see the *HP Insight Online User's Guide* on the HP website (http://www.hp.com/go/insightremotesupport/docs).

Intelligent Provisioning

Intelligent Provisioning is a single-server deployment tool embedded in HP ProLiant Gen8 and later servers that simplifies HP ProLiant server setup, providing a reliable and consistent way to deploy HP ProLiant server configurations:

- Intelligent Provisioning assists with the OS installation process by preparing the system for installing "off-the-shelf" and HP branded versions of operating system software and integrating optimized HP ProLiant server support software.
- Intelligent Provisioning provides maintenance-related tasks using the Perform Maintenance window.
- Intelligent Provisioning provides installation help for Microsoft Windows, Red Hat and SUSE Linux, and VMware operating systems. For specific OS support, see the *HP Intelligent Provisioning Release Notes* on the HP website (http://www.hp.com/go/intelligentprovisioning/docs).

For more information about Intelligent Provisioning software, see the HP website (http://www.hp.com/go/intelligentprovisioning). For Intelligent Provisioning recovery media downloads, see the Resources tab on the HP website (http://www.hp.com/go/ilo). For consolidated drive and firmware update packages, see the HP Smart Update: Server Firmware and Driver Updates page on the HP website (http://www.hp.com/go/SmartUpdate).

HP Insight Diagnostics

HP Insight Diagnostics is a proactive server management tool, available in both offline and online versions, that provides diagnostics and troubleshooting capabilities to assist IT administrators who verify server installations, troubleshoot problems, and perform repair validation.

HP Insight Diagnostics Offline Edition performs various in-depth system and component testing while the OS is not running. To run this utility, boot the server using Intelligent Provisioning (on page 110).

HP Insight Diagnostics Online Edition is a web-based application that captures system configuration and other related data needed for effective server management. Available in Microsoft Windows and Linux versions, the utility helps to ensure proper system operation.

For more information or to download the utility, see the HP website (http://www.hp.com/servers/diags). HP Insight Diagnostics Online Edition is also available in the SPP ("HP Service Pack for ProLiant" on page 112).

HP Insight Diagnostics survey functionality

HP Insight Diagnostics (on page 111) provides survey functionality that gathers critical hardware and software information on ProLiant servers.

This functionality supports operating systems that are supported by the server. For operating systems supported by the server, see the HP website (http://www.hp.com/go/supportos).

If a significant change occurs between data-gathering intervals, the survey function marks the previous information and overwrites the survey data files to reflect the latest changes in the configuration.

Survey functionality is installed with every Intelligent Provisioning-assisted HP Insight Diagnostics installation, or it can be installed through the SPP ("HP Service Pack for ProLiant" on page 112).

Erase Utility

△ **CAUTION:** Perform a backup before running the Erase Utility. The utility sets the system to its original factory state, deletes the current hardware configuration information, including array setup and disk partitioning, and erases all connected hard drives completely. Before using this utility, see the instructions in the *HP Intelligent Provisioning User Guide*.

Use the Erase Utility to erase drives and Active Health System logs, and to reset UEFI System Utilities settings. Run the Erase Utility if you must erase the system for the following reasons:

- You want to install a new operating system on a server with an existing operating system.
- You encounter an error when completing the steps of a factory-installed operating system installation.

To access the Erase Utility, click the Perform Maintenance icon from the Intelligent Provisioning home screen, and then select **Erase**.

For more information about the Erase Utility, see the *HP Intelligent Provisioning User Guide* on the HP website (http://www.hp.com/go/intelligentprovisioning/docs).

Scripting Toolkit for Windows and Linux

The Scripting Toolkit for Windows and Linux is a server deployment product that delivers an unattended automated installation for high-volume server deployments. The Scripting Toolkit is designed to support ProLiant BL, ML, DL, and SL servers. The toolkit includes a modular set of utilities and important documentation that describes how to apply these tools to build an automated server deployment process.

The Scripting Toolkit provides a flexible way to create standard server configuration scripts. These scripts are used to automate many of the manual steps in the server configuration process. This automated server configuration process cuts time from each deployment, making it possible to scale rapid, high-volume server deployments.

For more information, and to download the Scripting Toolkit, see the HP website (http://www.hp.com/go/ProLiant/STK).

HP Service Pack for ProLiant

SPP is a comprehensive systems software (drivers and firmware) solution delivered as a single package with major server releases. This solution uses HP SUM as the deployment tool and is tested on all supported HP ProLiant servers including HP ProLiant Gen8 and later servers.

SPP can be used in an online mode on a Windows or Linux hosted operating system, or in an offline mode where the server is booted to an operating system included on the ISO file so that the server can be updated automatically with no user interaction or updated in interactive mode.

For more information or to download SPP, see one of the following pages on the HP website:

- HP Service Pack for ProLiant download page (http://www.hp.com/go/spp)
- HP Smart Update: Server Firmware and Driver Updates page (http://www.hp.com/go/SmartUpdate)

HP Smart Update Manager

HP SUM is a product used to install and update firmware, drivers, and systems software on HP ProLiant servers. HP SUM provides a GUI and a command-line scriptable interface for deployment of systems software for single or one-to-many HP ProLiant servers and network-based targets, such as iLOs, OAs, and VC Ethernet and Fibre Channel modules.

For more information about HP SUM, see the product page on the HP website (http://www.hp.com/go/hpsum).

To download HP SUM, see the HP website (http://www.hp.com/go/hpsum/download).

To access the *HP Smart Update Manager User Guide*, see the HP SUM Information Library (http://www.hp.com/go/hpsum/documentation).

HP UEFI System Utilities

The HP UEFI System Utilities is embedded in the system ROM. The UEFI System Utilities enable you to perform a wide range of configuration activities, including:

- Configuring system devices and installed options
- Enabling and disabling system features
- Displaying system information
- Selecting the primary boot controller
- Configuring memory options
- Selecting a language
- Launching other pre-boot environments such as the Embedded UEFI Shell and Intelligent Provisioning

For more information on the HP UEFI System Utilities, see the *HP UEFI System Utilities User Guide for HP ProLiant Gen9 Servers* on the HP website (http://www.hp.com/go/ProLiantUEFI/docs).

Scan the QR code located at the bottom of the screen to access mobile-ready online help for the UEFI System Utilities and UEFI Shell. For on-screen help, press **F1**.

Using HP UEFI System Utilities

To use the System Utilities, use the following keys.

Action	**Key**
Access System Utilities	F9 during server POST
Navigate menus	Up and Down arrows
Select items	Enter
Save selections	F10
Access Help for a highlighted configuration option*	F1

*Scan the QR code on the screen to access online help for the UEFI System Utilities and UEFI Shell.

Default configuration settings are applied to the server at one of the following times:

- Upon the first system power-up
- After defaults have been restored

Default configuration settings are sufficient for typical server operations; however, you can modify configuration settings as needed. The system prompts you for access to the System Utilities each time the system is powered up.

Flexible boot control

This feature enables you to do the following:

- Add Boot Options
  - Browse all FAT16 and FAT32 file systems.
  - Select an X64 UEFI application with an .EFI extension to add as a new UEFI boot option, such as an OS boot loader or other UEFI application.

The new boot option is appended to the boot order list. When you select a file, you are prompted to enter the boot option description (which is then displayed in the Boot menu), as well as any optional data to be passed to an .EFI application.

- Boot to System Utilities

  Toward the end of the boot process, the boot options screen appears. This screen is visible for several seconds before the system attempts to boot from a supported boot device. During this time, you can access the System Utilities by pressing the **F9** key.

- Choose between supported modes: Legacy BIOS Boot Mode or UEFI Boot Mode

IMPORTANT: If the default boot mode settings are different than the user defined settings, the system may not boot the OS installation if the defaults are restored. To avoid this issue, use the User Defined Defaults feature in UEFI System Utilities to override the factory default settings.

For more information, see the *HP UEFI System Utilities User Guide for HP ProLiant Gen9 Servers* on the HP website (http://www.hp.com/go/ProLiantUEFI/docs).

Restoring and customizing configuration settings

You can reset all configuration settings to the factory default settings, or you can restore system default configuration settings, which are used instead of the factory default settings.

You can also configure default settings as necessary, and then save the configuration as the custom default configuration. When the system loads the default settings, it uses the custom default settings instead of the factory defaults.

Secure Boot configuration

Secure Boot is integrated in the UEFI specification on which the HP implementation of UEFI is based. Secure Boot is completely implemented in the BIOS and does not require special hardware. It ensures that each component launched during the boot process is digitally signed and that the signature is validated against a set of trusted certificates embedded in the UEFI BIOS. Secure Boot validates the software identity of the following components in the boot process:

- UEFI drivers loaded from PCIe cards
- UEFI drivers loaded from mass storage devices
- Pre-boot UEFI shell applications
- OS UEFI boot loaders

Once enabled, only firmware components and operating systems with boot loaders that have an appropriate digital signature can execute during the boot process. Only operating systems that support Secure Boot and have an EFI boot loader signed with one of the authorized keys can boot when Secure Boot is enabled. For more information about supported operating systems, see the *HP UEFI System Utilities and Shell Release Notes* on the HP website (http://www.hp.com/go/ProLiantUEFI/docs).

A physically present user can customize the certificates embedded in the UEFI BIOS by adding/removing their own certificates.

Embedded UEFI shell

The system BIOS in all HP ProLiant Gen9 servers includes an embedded UEFI Shell in the ROM. The UEFI Shell environment provides an API, a command line prompt, and a set of CLIs that allow scripting, file manipulation, and system information. These features enhance the capabilities of the UEFI System Utilities.

For more information, see the following documents:

- *HP UEFI Shell User Guide for HP ProLiant Gen9 Servers* on the HP website (http://www.hp.com/go/ProLiantUEFI/docs)
- *UEFI Shell Specification* on the UEFI website (http://www.uefi.org/specifications)

Embedded UEFI diagnostics

The system BIOS in all HP ProLiant Gen9 servers includes an embedded UEFI diagnostics tool in the ROM. The embedded UEFI diagnostics tool can run comprehensive diagnostics of the server hardware, including processors, memory, drives, and other server components.

For more information on the embedded UEFI diagnostics tool, see the *HP UEFI System Utilities User Guide for HP ProLiant Gen9 Servers* on the HP website (http://www.hp.com/go/ProLiantUEFI/docs).

HP RESTful API support for UEFI

HP ProLiant Gen9 servers include support for a UEFI compliant System BIOS, along with UEFI System Utilities and Embedded UEFI Shell pre-boot environments. HP ProLiant Gen9 servers also support configuring the UEFI BIOS settings using the HP RESTful API, a management interface that server management tools can use to perform configuration, inventory, and monitoring of an HP ProLiant server. A REST client uses HTTPS operations to configure supported server settings, such as UEFI BIOS settings.

For more information about the HP RESTful API and the HP RESTful Interface Tool, see the HP website (http://www.hp.com/support/restfulinterface/docs).

Re-entering the server serial number and product ID

After you replace the system board, you must re-enter the server serial number and the product ID.

1. During the server startup sequence, press the **F9** key to access UEFI System Utilities.
2. Select the **System Configuration** > **BIOS/Platform Configuration (RBSU)** > **Advanced Options** > **Advanced System ROM Options** > **Serial Number**, and then press the **Enter** key.
3. Enter the serial number and press the **Enter** key. The following message appears:

   ```
   The serial number should only be modified by qualified service personnel.
   This value should always match the serial number located on the chassis.
   ```
4. Press the **Enter** key to clear the warning.
5. Enter the serial number and press the **Enter** key.
6. Select **Product ID**. The following warning appears:

   ```
   Warning: The Product ID should ONLY be modified by qualified service
   personnel. This value should always match the Product ID located on the
   chassis.
   ```
7. Enter the product ID and press the **Enter** key.
8. Press the **F10** key to confirm exiting System Utilities. The server automatically reboots.

Utilities and features

HP Smart Storage Administrator

HP SSA is a configuration and management tool for HP Smart Array controllers. Starting with HP ProLiant Gen8 servers, HP SSA replaces ACU with an enhanced GUI and additional configuration features.

HP SSA exists in three interface formats: the HP SSA GUI, the HP SSA CLI, and HP SSA Scripting. Although all formats provide support for configuration tasks, some of the advanced tasks are available in only one format.

Some HP SSA features include the following:

- Supports online array capacity expansion, logical drive extension, assignment of online spares, and RAID or stripe size migration
- Suggests the optimal configuration for an unconfigured system
- Provides diagnostic and SmartSSD Wear Gauge functionality on the Diagnostics tab
- For supported controllers, provides access to additional features.

For more information about HP SSA, see the HP website (http://www.hp.com/go/hpssa).

ROMPaq utility

The ROMPaq utility enables you to upgrade the system firmware (BIOS). To upgrade the firmware, insert a ROMPaq USB Key into an available USB port and boot the system. In addition to ROMPaq, Online Flash Components for Windows and Linux operating systems are available for updating the system firmware.

The ROMPaq utility checks the system and provides a choice (if more than one exists) of available firmware revisions.

For more information, go to the HP website (http://www.hp.com/go/hpsc) and click on **Drivers, Software & Firmware**. Then, enter your product name in the **Find an HP product** field and click **Go**.

Automatic Server Recovery

ASR is a feature that causes the system to restart when a catastrophic operating system error occurs, such as a blue screen, ABEND, or panic. A system fail-safe timer, the ASR timer, starts when the System Management driver, also known as the Health Driver, is loaded. When the operating system is functioning properly, the system periodically resets the timer. However, when the operating system fails, the timer expires and restarts the server.

ASR increases server availability by restarting the server within a specified time after a system hang. You can disable ASR from the System Management Homepage or through UEFI System Utilities.

USB support

HP provides standard USB 2.0 support, standard USB 3.0 support, and legacy USB support. Standard support is provided by the OS through the appropriate USB device drivers.

Before the OS loads, HP provides support for USB 2.0 devices through legacy USB support, which is enabled by default in the system ROM. USB 3.0 ports are not functional before the OS loads. The native OS provides USB 3.0 support through appropriate xHCI drivers.

Legacy USB support provides USB functionality in environments where USB support is not available normally. Specifically, HP provides legacy USB functionality for the following:

- POST (system boot)
- UEFI System Utilities
- Pre-boot UEFI shell
- DOS
- Operating environments which do not provide native USB support

External USB functionality

HP provides external USB support to enable local connection of USB devices for server administration, configuration, and diagnostic procedures.

For additional security, external USB functionality can be disabled through USB options in UEFI System Utilities.

Redundant ROM support

The server enables you to upgrade or configure the ROM safely with redundant ROM support. The server has a single ROM that acts as two separate ROM images. In the standard implementation, one side of the ROM contains the current ROM program version, while the other side of the ROM contains a backup version.

NOTE: The server ships with the same version programmed on each side of the ROM.

Safety and security benefits

When you flash the system ROM, ROMPaq writes over the backup ROM and saves the current ROM as a backup, enabling you to switch easily to the alternate ROM version if the new ROM becomes corrupted for any reason. This feature protects the existing ROM version, even if you experience a power failure while flashing the ROM.

Keeping the system current

Drivers

IMPORTANT: Always perform a backup before installing or updating device drivers.

The server includes new hardware that may not have driver support on all OS installation media.

If you are installing an Intelligent Provisioning-supported OS, use Intelligent Provisioning (on page 110) and its Configure and Install feature to install the OS and latest supported drivers.

If you do not use Intelligent Provisioning to install an OS, drivers for some of the new hardware are required. These drivers, as well as other option drivers, ROM images, and value-add software can be downloaded as part of an SPP.

If you are installing drivers from SPP, be sure that you are using the latest SPP version that your server supports. To verify that your server is using the latest supported version and for more information about SPP, see the HP website (http://www.hp.com/go/spp/download).

To locate the drivers for a particular server, go to the HP website (http://www.hp.com/go/hpsc) and click on **Drivers, Software & Firmware**. Then, enter your product name in the **Find an HP product** field and click **Go**.

Software and firmware

Software and firmware should be updated before using the server for the first time, unless any installed software or components require an older version.

For system software and firmware updates, use one of the following sources:

- Download the SPP ("HP Service Pack for ProLiant" on page 112) from the HP Service Pack for ProLiant download page (http://www.hp.com/go/spp).
- Download individual drivers, firmware, or other systems software components from the server product page in the HP Support Center (http://www.hp.com/go/hpsc).

Version control

The VCRM and VCA are web-enabled Insight Management Agents tools that HP SIM uses to schedule software update tasks to the entire enterprise.

- VCRM manages the repository for SPP. Administrators can view the SPP contents or configure VCRM to automatically update the repository with internet downloads of the latest software and firmware from HP.
- VCA compares installed software versions on the node with updates available in the VCRM managed repository. Administrators configure VCA to point to a repository managed by VCRM.

For more information about version control tools, see the *HP Systems Insight Manager User Guide*, the *HP Version Control Agent User Guide*, and the *HP Version Control Repository User Guide* on the HP website (http://www.hp.com/go/hpsim).

HP operating systems and virtualization software support for ProLiant servers

For information about specific versions of a supported operating system, see the HP website (http://www.hp.com/go/ossupport).

HP Technology Service Portfolio

Connect to HP for assistance on the journey to the new style of IT. HP Technology Services delivers confidence and reduces risk to help you realize agility and stability in your IT infrastructure.

Utilize our consulting expertise in the areas of private or hybrid cloud computing, big data and mobility requirements, improving data center infrastructure and better use of today's server, storage and networking technology. For more information, see the HP website (http://www.hp.com/services/consulting).

Our support portfolio covers services for HP server, storage and networking hardware and software plus the leading industry standard operating systems. Let us work proactively with you to prevent problems. Our flexible choices of hardware and software support coverage windows and response times help resolve problems faster, reduce unplanned outages and free your staff for more important tasks. For more information, see the HP website (http://www.hp.com/services/support).

Tap into our knowledge, expertise, innovation and world-class services to achieve better results. Access and apply technology in new ways to optimize your operations and you'll be positioned for success.

Change control and proactive notification

HP offers Change Control and Proactive Notification to notify customers 30 to 60 days in advance of upcoming hardware and software changes on HP commercial products.

For more information, refer to the HP website (http://www.hp.com/go/pcn).

Troubleshooting

Troubleshooting resources

The *HP ProLiant Gen9 Troubleshooting Guide, Volume I: Troubleshooting* provides procedures for resolving common problems and comprehensive courses of action for fault isolation and identification, issue resolution, and software maintenance on ProLiant servers and server blades. To view the guide, select a language:

- English (http://www.hp.com/support/Gen9_TSG_en)
- French (http://www.hp.com/support/Gen9_TSG_fr)
- Spanish (http://www.hp.com/support/Gen9_TSG_es)
- German (http://www.hp.com/support/Gen9_TSG_de)
- Japanese (http://www.hp.com/support/Gen9_TSG_ja)
- Simplified Chinese (http://www.hp.com/support/Gen9_TSG_zh_cn)

The *HP ProLiant Gen9 Troubleshooting Guide, Volume II: Error Messages* provides a list of error messages and information to assist with interpreting and resolving error messages on ProLiant servers and server blades. To view the guide, select a language:

- English (http://www.hp.com/support/Gen9_EMG_en)
- French (http://www.hp.com/support/Gen9_EMG_fr)
- Spanish (http://www.hp.com/support/Gen9_EMG_es)
- German (http://www.hp.com/support/Gen9_EMG_de)
- Japanese (http://www.hp.com/support/Gen9_EMG_ja)
- Simplified Chinese (http://www.hp.com/support/Gen9_EMG_zh_cn)

System battery replacement

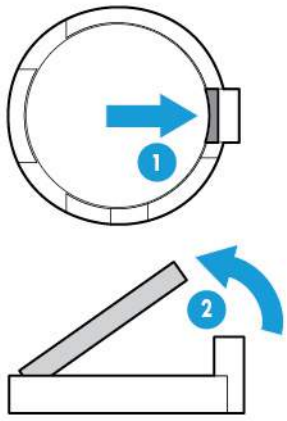
If the server no longer automatically displays the correct date and time, then replace the battery that provides power to the real-time clock. Under normal use, battery life is 5 to 10 years.

WARNING: The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose the battery to temperatures higher than 60°C (140°F).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the spare designated for this product.

To remove the component:

1. Power down the server (on page 20).
2. Remove all power:
   a. Disconnect each power cord from the power source.
   b. Disconnect each power cord from the server.
3. Do one of the following:
   - Extend the server from the rack (on page 20).
   - Remove the server from the rack (on page 22).
4. Remove the access panel (on page 24).
5. Locate the battery on the system board ("System board components" on page 13).
6. Remove the battery.



IMPORTANT: Replacing the system board battery resets the system ROM to its default configuration. After replacing the battery, use BIOS/Platform Configuration (RBSU) in the UEFI System Utilities ("HP UEFI System Utilities" on page 113) to reconfigure the system.

To replace the component, reverse the removal procedure.

For more information about battery replacement or proper disposal, contact an authorized reseller or an authorized service provider.

Regulatory information

Safety and regulatory compliance

For safety, environmental, and regulatory information, see *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at the HP website (http://www.hp.com/support/Safety-Compliance-EnterpriseProducts).

Belarus Kazakhstan Russia marking

Manufacturer

Hewlett-Packard Company, Address: 3000 Hanover Street, Palo Alto, California 94304, U.S.

Local representative information (Russian)

- HP Russia

  ЗАО "Хьюлетт-Паккард А.О.", 125171, Россия, г. Москва, Ленинградское шоссе, 16А, стр.3, тел/факс: +7 (495) 797 35 00, +7 (495) 287 89 05

- HP Belarus

  ИООО «Хьюлетт-Паккард Бел», 220030, Беларусь, г. Минск, ул. Интернациональная, 36-1, офис 722-723, тел.: +375 (17) 392 28 18, факс: +375 (17) 392 28 21

- HP Kazakhstan

  ТОО «Хьюлетт-Паккард (К), 050040, Казахстан, г. Алматы, Бостандыкский район, ул. Тимирязева, 28В, 1 этаж, тел./факс: +7 (727) 355 35 50, +7 (727) 355 35 51

Local representative information (Kazakh)

ЖШС «Хьюлетт-Паккард (К)», Қазақстан, Алматы қ., Бостандық ауданы, Тимирязев к-сі, 28В, тел./факс: +7 (727) 355 35 50, +7 (727) 355 35 51

Manufacturing date

The manufacturing date is defined by the serial number (HP serial number format for this product):
CCSYWWZZZZ

Valid date formats include the following:

- YWW, where Y indicates the year counting from within each new decade, with 2000 as the starting point. For example, 238: 2 for 2002 and 38 for the week of September 9. In addition, 2010 is indicated by 0, 2011 by 1, 2012 by 2, 2013 by 3, and so forth.
- YYWW, where YY indicates the year, using a base year of 2000. For example, 0238: 02 for 2002 and 38 for the week of September 9.

Turkey RoHS material content declaration

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Ukraine RoHS material content declaration

Обладнання відповідає вимогам Технічного регламенту щодо обмеження використання деяких небезпечних речовин в електричному та електронному обладнанні, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057

Warranty information

HP ProLiant and X86 Servers and Options (http://www.hp.com/support/ProLiantServers-Warranties)

HP Enterprise Servers (http://www.hp.com/support/EnterpriseServers-Warranties)

HP Storage Products (http://www.hp.com/support/Storage-Warranties)

HP Networking Products (http://www.hp.com/support/Networking-Warranties)

Electrostatic discharge

Preventing electrostatic discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Grounding methods to prevent electrostatic discharge

Several methods are used for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ±10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part.

For more information on static electricity or assistance with product installation, contact an authorized reseller.

Specifications

Environmental specifications

Specification	Value
Temperature range*	—
Operating	10°C to 35°C (50°F to 95°F)
Nonoperating	-30°C to 60°C (-22°F to 140°F)
Relative humidity (noncondensing)	—
Operating	Minimum to be the higher (more moisture) of -12°C (10.4°F) dew point or 8% relative humidity Maximum to be 24°C (75.2°F) dew point or 90% relative humidity
Nonoperating	5% to 95% 38.7°C (101.7°F), maximum wet bulb temperature

* All temperature ratings shown are for sea level. An altitude derating of 1.0°C per 304.8 m (1.8°F per 1000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed. Maximum rate of change is 20°C per hour (36°F per hour). The upper limit and rate of change might be limited by the type and number of options installed.

For certain approved hardware configurations, the supported system inlet temperature range is extended:

- 5°C to 10°C (41°F to 50°F) and 35°C to 40°C (95°F to 104°F) at sea level with an altitude derating of 1.0°C per every 175 m (1.8°F per every 574 ft) above 900 m (2953 ft) to a maximum of 3048 m (10,000 ft).
- 40°C to 45°C (104°F to 113°F) at sea level with an altitude derating of 1.0°C per every 125 m (1.8°F per every 410 ft) above 900 m (2953 ft) to a maximum of 3048 m (10,000 ft).

The approved hardware configurations for this system are listed on the HP website (http://www.hp.com/go/proliant/ASHRAE).

Mechanical specifications

Dimension	Value
Height	8.75 cm (3.44 in)
Depth for both the LFF and SFF drive models	60.70 cm (23.90 in)
Width	44.54 cm (17.50 in)
Weight (full load, approximate values)	—
4-bay LFF drive model	16.59 kg (36.58 lb)
8-bay LFF drive model	19.19 kg (42.31 lb)
12-bay LFF drive model	21.59 kg (47.60 lb)

Dimension	Value
8-bay SFF drive model with optical drive	16.09 kg (35.48 lb)
8-bay SFF drive model without optical drive	15.95 kg (35.17 lb)
16-bay SFF drive model with optical drive	17.95 kg (39.60 lb)
16-bay SFF drive model without optical drive	17.87 kg (39.40 lb)

Power supply specifications

The server supports the HP 550-W Power Supply (PN 730941-B21). This is an Entry Level Power Supply product for HP ProLiant servers. For more information about the power supply features, specifications, and compatibility, see the HP website (http://www.hp.com/go/proliant/powersupply).

CAUTION: Check the system and power supply input ratings before powering up the server.

Support and other resources

Before you contact HP

Be sure to have the following information available before you call HP:

- Active Health System log (HP ProLiant Gen8 or later products)

  Download and have available an Active Health System log for 7 days before the failure was detected. For more information, see the *HP iLO 4 User Guide* or *HP Intelligent Provisioning User Guide* on the HP website (http://www.hp.com/go/ilo/docs).
- Onboard Administrator SHOW ALL report (for HP BladeSystem products only)

  For more information on obtaining the Onboard Administrator SHOW ALL report, see the HP website (http://www.hp.com/go/OAlog).
- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Product identification number
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

HP contact information

For United States and worldwide contact information, see the Contact HP website (http://www.hp.com/go/assistance).

In the United States:

- To contact HP by phone, call 1-800-334-5144. For continuous quality improvement, calls may be recorded or monitored.
- If you have purchased a Care Pack (service upgrade), see the Support & Drivers website (http://www8.hp.com/us/en/support-drivers.html). If the problem cannot be resolved at the website, call 1-800-633-3600. For more information about Care Packs, see the HP website (http://pro-aq-sama.houston.hp.com/services/cache/10950-0-0-225-121.html).

Customer Self Repair

HP products are designed with many Customer Self Repair (CSR) parts to minimize repair time and allow for greater flexibility in performing defective parts replacement. If during the diagnosis period HP (or HP service

providers or service partners) identifies that the repair can be accomplished by the use of a CSR part, HP will ship that part directly to you for replacement. There are two categories of CSR parts:

- **Mandatory**—Parts for which customer self repair is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.
- **Optional**—Parts for which customer self repair is optional. These parts are also designed for customer self repair. If, however, you require that HP replace them for you, there may or may not be additional charges, depending on the type of warranty service designated for your product.

NOTE: Some HP parts are not designed for customer self repair. In order to satisfy the customer warranty, HP requires that an authorized service provider replace the part. These parts are identified as "No" in the Illustrated Parts Catalog.

Based on availability and where geography permits, CSR parts will be shipped for next business day delivery. Same day or four-hour delivery may be offered at an additional charge where geography permits. If assistance is required, you can call the HP Technical Support Center and a technician will help you over the telephone. HP specifies in the materials shipped with a replacement CSR part whether a defective part must be returned to HP. In cases where it is required to return the defective part to HP, you must ship the defective part back to HP within a defined period of time, normally five (5) business days. The defective part must be returned with the associated documentation in the provided shipping material. Failure to return the defective part may result in HP billing you for the replacement. With a customer self repair, HP will pay all shipping and part return costs and determine the courier/carrier to be used.

For more information about HP's Customer Self Repair program, contact your local service provider. For the North American program, refer to the HP website (http://www.hp.com/go/selfrepair).

Réparation par le client (CSR)

Les produits HP comportent de nombreuses pièces CSR (Customer Self Repair = réparation par le client) afin de minimiser les délais de réparation et faciliter le remplacement des pièces défectueuses. Si pendant la période de diagnostic, HP (ou ses partenaires ou mainteneurs agréés) détermine que la réparation peut être effectuée à l'aide d'une pièce CSR, HP vous l'envoie directement. Il existe deux catégories de pièces CSR:

Obligatoire - Pièces pour lesquelles la réparation par le client est obligatoire. Si vous demandez à HP de remplacer ces pièces, les coûts de déplacement et main d'œuvre du service vous seront facturés.

Facultatif - Pièces pour lesquelles la réparation par le client est facultative. Ces pièces sont également conçues pour permettre au client d'effectuer lui-même la réparation. Toutefois, si vous demandez à HP de remplacer ces pièces, l'intervention peut ou non vous être facturée, selon le type de garantie applicable à votre produit.

REMARQUE: Certaines pièces HP ne sont pas conçues pour permettre au client d'effectuer lui-même la réparation. Pour que la garantie puisse s'appliquer, HP exige que le remplacement de la pièce soit effectué par un Mainteneur Agréé. Ces pièces sont identifiées par la mention "Non" dans le Catalogue illustré.

Les pièces CSR sont livrées le jour ouvré suivant, dans la limite des stocks disponibles et selon votre situation géographique. Si votre situation géographique le permet et que vous demandez une livraison le jour même ou dans les 4 heures, celle-ci vous sera facturée. Pour bénéficier d'une assistance téléphonique, appelez le Centre d'assistance technique HP. Dans les documents envoyés avec la pièce de rechange CSR, HP précise s'il est nécessaire de lui retourner la pièce défectueuse. Si c'est le cas, vous devez le faire dans le délai indiqué, généralement cinq (5) jours ouvrés. La pièce et sa documentation doivent être retournées dans l'emballage fourni. Si vous ne retournez pas la pièce défectueuse, HP se réserve le droit de vous facturer les coûts de remplacement. Dans le cas d'une pièce CSR, HP supporte l'ensemble des frais d'expédition et de retour, et détermine la société de courses ou le transporteur à utiliser.

Pour plus d'informations sur le programme CSR de HP, contactez votre Mainteneur Agrée local. Pour plus d'informations sur ce programme en Amérique du Nord, consultez le site Web HP (http://www.hp.com/go/selfrepair).

Riparazione da parte del cliente

Per abbreviare i tempi di riparazione e garantire una maggiore flessibilità nella sostituzione di parti difettose, i prodotti HP sono realizzati con numerosi componenti che possono essere riparati direttamente dal cliente (CSR, Customer Self Repair). Se in fase di diagnostica HP (o un centro di servizi o di assistenza HP) identifica il guasto come riparabile mediante un ricambio CSR, HP lo spedirà direttamente al cliente per la sostituzione. Vi sono due categorie di parti CSR:

Obbligatorie – Parti che devono essere necessariamente riparate dal cliente. Se il cliente ne affida la riparazione ad HP, deve sostenere le spese di spedizione e di manodopera per il servizio.

Opzionali – Parti la cui riparazione da parte del cliente è facoltativa. Si tratta comunque di componenti progettati per questo scopo. Se tuttavia il cliente ne richiede la sostituzione ad HP, potrebbe dover sostenere spese addizionali a seconda del tipo di garanzia previsto per il prodotto.

NOTA: alcuni componenti HP non sono progettati per la riparazione da parte del cliente. Per rispettare la garanzia, HP richiede che queste parti siano sostituite da un centro di assistenza autorizzato. Tali parti sono identificate da un "No" nel Catalogo illustrato dei componenti.

In base alla disponibilità e alla località geografica, le parti CSR vengono spedite con consegna entro il giorno lavorativo seguente. La consegna nel giorno stesso o entro quattro ore è offerta con un supplemento di costo solo in alcune zone. In caso di necessità si può richiedere l'assistenza telefonica di un addetto del centro di supporto tecnico HP. Nel materiale fornito con una parte di ricambio CSR, HP specifica se il cliente deve restituire dei componenti. Qualora sia richiesta la resa ad HP del componente difettoso, lo si deve spedire ad HP entro un determinato periodo di tempo, generalmente cinque (5) giorni lavorativi. Il componente difettoso deve essere restituito con la documentazione associata nell'imballo di spedizione fornito. La mancata restituzione del componente può comportare la fatturazione del ricambio da parte di HP. Nel caso di riparazione da parte del cliente, HP sostiene tutte le spese di spedizione e resa e sceglie il corriere/vettore da utilizzare.

Per ulteriori informazioni sul programma CSR di HP contattare il centro di assistenza di zona. Per il programma in Nord America fare riferimento al sito Web HP (http://www.hp.com/go/selfrepair).

Customer Self Repair

HP Produkte enthalten viele CSR-Teile (Customer Self Repair), um Reparaturzeiten zu minimieren und höhere Flexibilität beim Austausch defekter Bauteile zu ermöglichen. Wenn HP (oder ein HP Servicepartner) bei der Diagnose feststellt, dass das Produkt mithilfe eines CSR-Teils repariert werden kann, sendet Ihnen HP dieses Bauteil zum Austausch direkt zu. CSR-Teile werden in zwei Kategorien unterteilt:

Zwingend – Teile, für die das Customer Self Repair-Verfahren zwingend vorgegeben ist. Wenn Sie den Austausch dieser Teile von HP vornehmen lassen, werden Ihnen die Anfahrt- und Arbeitskosten für diesen Service berechnet.

Optional – Teile, für die das Customer Self Repair-Verfahren optional ist. Diese Teile sind auch für Customer Self Repair ausgelegt. Wenn Sie jedoch den Austausch dieser Teile von HP vornehmen lassen möchten, können bei diesem Service je nach den für Ihr Produkt vorgesehenen Garantiebedingungen zusätzliche Kosten anfallen.

HINWEIS: Einige Teile sind nicht für Customer Self Repair ausgelegt. Um den Garantieanspruch des Kunden zu erfüllen, muss das Teil von einem HP Servicepartner ersetzt werden. Im illustrierten Teilekatalog sind diese Teile mit „No“ bzw. „Nein“ gekennzeichnet.

CSR-Teile werden abhängig von der Verfügbarkeit und vom Lieferziel am folgenden Geschäftstag geliefert. Für bestimmte Standorte ist eine Lieferung am selben Tag oder innerhalb von vier Stunden gegen einen Aufpreis verfügbar. Wenn Sie Hilfe benötigen, können Sie das HP technische Support Center anrufen und sich von einem Mitarbeiter per Telefon helfen lassen. Den Materialien, die mit einem CSR-Ersatzteil geliefert werden, können Sie entnehmen, ob das defekte Teil an HP zurückgeschickt werden muss. Wenn es erforderlich ist, das defekte Teil an HP zurückzuschicken, müssen Sie dies innerhalb eines vorgegebenen Zeitraums tun, in der Regel innerhalb von fünf (5) Geschäftstagen. Das defekte Teil muss mit der zugehörigen Dokumentation in der Verpackung zurückgeschickt werden, die im Lieferumfang enthalten ist. Wenn Sie das defekte Teil nicht zurückschicken, kann HP Ihnen das Ersatzteil in Rechnung stellen. Im Falle von Customer Self Repair kommt HP für alle Kosten für die Lieferung und Rücksendung auf und bestimmt den Kurier-/Frachtdienst.

Weitere Informationen über das HP Customer Self Repair Programm erhalten Sie von Ihrem Servicepartner vor Ort. Informationen über das CSR-Programm in Nordamerika finden Sie auf der HP Website unter (http://www.hp.com/go/selfrepair).

Reparaciones del propio cliente

Los productos de HP incluyen muchos componentes que el propio usuario puede reemplazar (*Customer Self Repair*, CSR) para minimizar el tiempo de reparación y ofrecer una mayor flexibilidad a la hora de realizar sustituciones de componentes defectuosos. Si, durante la fase de diagnóstico, HP (o los proveedores o socios de servicio de HP) identifica que una reparación puede llevarse a cabo mediante el uso de un componente CSR, HP le enviará dicho componente directamente para que realice su sustitución. Los componentes CSR se clasifican en dos categorías:

- **Obligatorio:** componentes para los que la reparación por parte del usuario es obligatoria. Si solicita a HP que realice la sustitución de estos componentes, tendrá que hacerse cargo de los gastos de desplazamiento y de mano de obra de dicho servicio.
- **Opcional:** componentes para los que la reparación por parte del usuario es opcional. Estos componentes también están diseñados para que puedan ser reparados por el usuario. Sin embargo, si precisa que HP realice su sustitución, puede o no conllevar costes adicionales, dependiendo del tipo de servicio de garantía correspondiente al producto.

NOTA: Algunos componentes no están diseñados para que puedan ser reparados por el usuario. Para que el usuario haga valer su garantía, HP pone como condición que un proveedor de servicios autorizado realice la sustitución de estos componentes. Dichos componentes se identifican con la palabra "No" en el catálogo ilustrado de componentes.

Según la disponibilidad y la situación geográfica, los componentes CSR se enviarán para que lleguen a su destino al siguiente día laborable. Si la situación geográfica lo permite, se puede solicitar la entrega en el mismo día o en cuatro horas con un coste adicional. Si precisa asistencia técnica, puede llamar al Centro de asistencia técnica de HP y recibirá ayuda telefónica por parte de un técnico. Con el envío de materiales para la sustitución de componentes CSR, HP especificará si los componentes defectuosos deberán devolverse a HP. En aquellos casos en los que sea necesario devolver algún componente a HP, deberá hacerlo en el periodo de tiempo especificado, normalmente cinco días laborables. Los componentes defectuosos deberán devolverse con toda la documentación relacionada y con el embalaje de envío. Si no enviara el componente defectuoso requerido, HP podrá cobrarle por el de sustitución. En el caso de todas

sustituciones que lleve a cabo el cliente, HP se hará cargo de todos los gastos de envío y devolución de componentes y escogerá la empresa de transporte que se utilice para dicho servicio.

Para obtener más información acerca del programa de Reparaciones del propio cliente de HP, póngase en contacto con su proveedor de servicios local. Si está interesado en el programa para Norteamérica, visite la página web de HP siguiente (http://www.hp.com/go/selfrepair).

Customer Self Repair

Veel onderdelen in HP producten zijn door de klant zelf te repareren, waardoor de reparatieduur tot een minimum beperkt kan blijven en de flexibiliteit in het vervangen van defecte onderdelen groter is. Deze onderdelen worden CSR-onderdelen (Customer Self Repair) genoemd. Als HP (of een HP Service Partner) bij de diagnose vaststelt dat de reparatie kan worden uitgevoerd met een CSR-onderdeel, verzendt HP dat onderdeel rechtstreeks naar u, zodat u het defecte onderdeel daarmee kunt vervangen. Er zijn twee categorieën CSR-onderdelen:

Verplicht: Onderdelen waarvoor reparatie door de klant verplicht is. Als u HP verzoekt deze onderdelen voor u te vervangen, worden u voor deze service reiskosten en arbeidsloon in rekening gebracht.

Optioneel: Onderdelen waarvoor reparatie door de klant optioneel is. Ook deze onderdelen zijn ontworpen voor reparatie door de klant. Als u echter HP verzoekt deze onderdelen voor u te vervangen, kunnen daarvoor extra kosten in rekening worden gebracht, afhankelijk van het type garantieservice voor het product.

OPMERKING: Sommige HP onderdelen zijn niet ontwikkeld voor reparatie door de klant. In verband met de garantievoorwaarden moet het onderdeel door een geautoriseerde Service Partner worden vervangen. Deze onderdelen worden in de geïllustreerde onderdelencatalogus aangemerkt met "Nee".

Afhankelijk van de leverbaarheid en de locatie worden CSR-onderdelen verzonden voor levering op de eerstvolgende werkdag. Levering op dezelfde dag of binnen vier uur kan tegen meerkosten worden aangeboden, indien dit mogelijk is gezien de locatie. Indien assistentie gewenst is, belt u een HP Service Partner om via de telefoon technische ondersteuning te ontvangen. HP vermeldt in de documentatie bij het vervangende CSR-onderdeel of het defecte onderdeel aan HP moet worden geretourneerd. Als het defecte onderdeel aan HP moet worden teruggezonden, moet u het defecte onderdeel binnen een bepaalde periode, gewoonlijk vijf (5) werkdagen, retourneren aan HP. Het defecte onderdeel moet met de bijbehorende documentatie worden geretourneerd in het meegeleverde verpakkingsmateriaal. Als u het defecte onderdeel niet terugzendt, kan HP u voor het vervangende onderdeel kosten in rekening brengen. Bij reparatie door de klant betaalt HP alle verzendkosten voor het vervangende en geretourneerde onderdeel en kiest HP zelf welke koerier/transportonderneming hiervoor wordt gebruikt.

Neem contact op met een Service Partner voor meer informatie over het Customer Self Repair programma van HP. Informatie over Service Partners vindt u op de HP website (http://www.hp.com/go/selfrepair).

Reparo feito pelo cliente

Os produtos da HP são projetados com muitas peças para reparo feito pelo cliente (CSR) de modo a minimizar o tempo de reparo e permitir maior flexibilidade na substituição de peças com defeito. Se, durante o período de diagnóstico, a HP (ou fornecedores/parceiros de serviço da HP) concluir que o reparo pode ser efetuado pelo uso de uma peça CSR, a peça de reposição será enviada diretamente ao cliente. Existem duas categorias de peças CSR:

Obrigatória – Peças cujo reparo feito pelo cliente é obrigatório. Se desejar que a HP substitua essas peças, serão cobradas as despesas de transporte e mão-de-obra do serviço.

Opcional – Peças cujo reparo feito pelo cliente é opcional. Essas peças também são projetadas para o reparo feito pelo cliente. No entanto, se desejar que a HP as substitua, pode haver ou não a cobrança de taxa adicional, dependendo do tipo de serviço de garantia destinado ao produto.

OBSERVAÇÃO: Algumas peças da HP não são projetadas para o reparo feito pelo cliente. A fim de cumprir a garantia do cliente, a HP exige que um técnico autorizado substitua a peça. Essas peças estão identificadas com a marca "No" (Não), no catálogo de peças ilustrado.

Conforme a disponibilidade e o local geográfico, as peças CSR serão enviadas no primeiro dia útil após o pedido. Onde as condições geográficas permitirem, a entrega no mesmo dia ou em quatro horas pode ser feita mediante uma taxa adicional. Se precisar de auxílio, entre em contato com o Centro de suporte técnico da HP para que um técnico o ajude por telefone. A HP especifica nos materiais fornecidos com a peça CSR de reposição se a peça com defeito deve ser devolvida à HP. Nos casos em que isso for necessário, é preciso enviar a peça com defeito à HP dentro do período determinado, normalmente cinco (5) dias úteis. A peça com defeito deve ser enviada com a documentação correspondente no material de transporte fornecido. Caso não o faça, a HP poderá cobrar a reposição. Para as peças de reparo feito pelo cliente, a HP paga todas as despesas de transporte e de devolução da peça e determina a transportadora/serviço postal a ser utilizado.

Para obter mais informações sobre o programa de reparo feito pelo cliente da HP, entre em contato com o fornecedor de serviços local. Para o programa norte-americano, visite o site da HP (http://www.hp.com/go/selfrepair).

カスタマーセルフリペア

修理時間を短縮し、故障部品の交換における高い柔軟性を確保するために、HP製品には多数のCSR部品があります。診断の際に、CSR部品を使用すれば修理ができるとHP（HPまたはHP正規保守代理店）が判断した場合、HPはその部品を直接、お客様に発送し、お客様に交換していただきます。CSR部品には以下の2通りがあります。

- **必須 -** カスタマーセルフリペアが必須の部品。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、その修理サービスに関する交通費および人件費がお客様に請求されます。
- **任意 -** カスタマーセルフリペアが任意である部品。この部品もカスタマーセルフリペア用です。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、お買い上げの製品に適用される保証サービス内容の範囲内においては、別途費用を負担していただくことなく保証サービスを受けることができます。

注： HP製品の一部の部品は、カスタマーセルフリペア用ではありません。製品の保証を継続するためには、HPまたはHP正規保守代理店による交換作業が必須となります。部品カタログには、当該部品がカスタマーセルフリペア除外品である旨が記載されています。

部品供給が可能な場合、地域によっては、CSR部品を翌営業日に届くように発送します。また、地域によっては、追加費用を負担いただくことにより同日または4時間以内に届くように発送することも可能な場合があります。サポートが必要なときは、HPの修理受付窓口に電話していただければ、技術者が電話でアドバイスします。交換用のCSR部品または同梱物には、故障部品をHPに返送する必要があるかどうかが表示されています。故障部品をHPに返送する必要がある場合は、指定期限内（通常は5営業日以内）に故障部品をHPに返送してください。故障部品を返送する場合は、届いた時の梱包箱に関連書類とともに入れてください。故障部品を返送しない場合、HPから部品費用が請求されます。カスタマーセルフリペアの際には、HPは送料および部品返送費を全額負担し、使用する宅配便会社や運送会社を指定します。

客户自行维修

HP 产品提供许多客户自行维修 (CSR) 部件，以尽可能缩短维修时间和在更换缺陷部件方面提供更大的灵活性。如果在诊断期间 HP（或 HP 服务提供商或服务合作伙伴）确定可以通过使用 CSR 部件完成维修，HP 将直接把该部件发送给您进行更换。有两类 CSR 部件：

- **强制性的** — 要求客户必须自行维修的部件。如果您请求 HP 更换这些部件，则必须为该服务支付差旅费和人工费用。
- **可选的** — 客户可以选择是否自行维修的部件。这些部件也是为客户自行维修设计的。不过，如果您要求 HP 为您更换这些部件，则根据为您的产品指定的保修服务类型，HP 可能收取或不再收取任何附加费用。

注：某些 HP 部件的设计并未考虑客户自行维修。为了满足客户保修的需要，HP 要求授权服务提供商更换相关部件。这些部件在部件图解目录中标记为“否”。

CSR 部件将在下一个工作日发运（取决于备货情况和允许的地理范围）。在允许的地理范围内，可在当天或四小时内发运，但要收取额外费用。如果需要帮助，您可以致电 HP 技术支持中心，将会有技术人员通过电话为您提供帮助。HP 会在随更换的 CSR 部件发运的材料中指明是否必须将有缺陷的部件返还给 HP。如果要求您将有缺陷的部件返还给 HP，那么您必须在规定期限内（通常是五 (5) 个工作日）将缺陷部件发给 HP。有缺陷的部件必须随所提供的发运材料中的相关文件一起返还。如果未能送还有缺陷的部件，HP 可能会要求您支付更换费用。客户自行维修时，HP 将承担所有相关运输和部件返回费用，并指定快递商/承运商。

有关 HP 客户自行维修计划的详细信息，请与您当地的服务提供商联系。有关北美地区的计划，请访问 HP 网站 (http://www.hp.com/go/selfrepair)。

客戶自行維修

HP 產品設計了許多「客戶自行維修」(CSR) 的零件以減少維修時間，並且使得更換瑕疵零件時能有更大的彈性。如果在診斷期間 HP（或 HP 服務供應商或維修夥伴）辨認出此項維修工作可以藉由使用 CSR 零件來完成，則 HP 將直接寄送該零件給您作更換。CSR 零件分為兩種類別：

- **強制的** — 客戶自行維修所使用的零件是強制性的。如果您要求 HP 更換這些零件，HP 將會向您收取此服務所需的外出費用與勞動成本。
- **選購的** — 客戶自行維修所使用的零件是選購的。這些零件也設計用於客戶自行維修之用。不過，如果您要求 HP 為您更換，則可能需要也可能不需要負擔額外的費用，端視針對此產品指定的保固服務類型而定。

備註：某些 HP 零件沒有消費者可自行維修的設計。為符合客戶保固，HP 需要授權的服務供應商更換零件。這些零件在圖示的零件目錄中，被標示為「否」。

基於材料取得及環境允許的情況下，CSR 零件將於下一個工作日以快遞寄送。在環境的允許下當天或四小時內送達，則可能需要額外的費用。若您需要協助，可致電「HP 技術支援中心」，會有一位技術人員透過電話來協助您。不論損壞的零件是否必須退回，HP 皆會在與 CSR 替換零件一起運送的材料中註明。若要將損壞的零件退回 HP，您必須在指定的一段時間內（通常為五 (5) 個工作天），將損壞的零件寄回 HP。損壞的零件必須與寄送資料中隨附的相關技術文件一併退還。如果無法退還損壞的零件，HP 可能要向您收取替換費用。針對客戶自行維修情形，HP 將負責所有運費及零件退還費用並指定使用何家快遞/貨運公司。

如需 HP 的「客戶自行維修」方案詳細資訊，請連絡您當地的服務供應商。至於北美方案，請參閱 HP 網站 (http://www.hp.com/go/selfrepair)。

고객 셀프 수리

HP 제품은 수리 시간을 최소화하고 결함이 있는 부품 교체 시 더욱 융통성을 발휘할 수 있도록 하기 위해 고객 셀프 수리(CSR) 부품을 다량 사용하여 설계되었습니다. 진단 기간 동안 HP(또는 HP 서비스 공급업체 또는 서비스 협력업체)에서 CSR 부품을 사용하여 수리가 가능하다고 판단되면 HP는 해당 부품을 바로 사용자에게 보내어 사용자가 교체할 수 있도록 합니다. CSR 부품에는 두 가지 종류가 있습니다.

- **고객 셀프 수리가 의무 사항인 필수 부품.** 사용자가 HP에 이 부품의 교체를 요청할 경우 이 서비스에 대한 출장비 및 작업비가 청구됩니다.
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Acronyms and abbreviations

ABEND

abnormal end

ACU

Array Configuration Utility

AMP

Advanced Memory Protection

API

application program interface

ASHRAE

American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASR

Automatic Server Recovery

BP

backplane

CAS

column address strobe

CSA

Canadian Standards Association

CSR

Customer Self Repair

DDR3

double data rate-3

DDR4

double data rate-4

DPC

DIMMs per channel

FAT

file allocation table

FBWC

flash-backed write cache

GPU

graphics processing unit

HBA

host bus adapter

HP SIM

HP Systems Insight Manager

HP SUM

HP Smart Update Manager

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

IML

Integrated Management Log

ISO

International Organization for Standardization

JSON

JavaScript Object Notation

LFF

large form factor

LOM

Lights-Out Management

LRDIMM

load reduced dual in-line memory module

NMI

nonmaskable interrupt

NVRAM

nonvolatile memory

OA

Onboard Administrator

ODD

Optical Disk Drive

PCIe

Peripheral Component Interconnect Express

PDU

power distribution unit

POST

Power-On Self Test

PSU

power supply unit

RBSU

ROM-Based Setup Utility

RDIMM

registered dual in-line memory module

RDP

Rapid Deployment Pack

REST

representational state transfer

RoHS

Restriction of Hazardous Substances

RPS

redundant power supply

SAS

serial attached SCSI

SATA

serial ATA

SD

Secure Digital

SFF

small form factor

SIM

Systems Insight Manager

SPP

HP Service Pack for ProLiant

SSA

HP Smart Storage Administrator

SSD

solid-state drive

STD

standard (DIMM voltage)

TMRA

recommended ambient operating temperature

TPM

Trusted Platform Module

UEFI

Unified Extensible Firmware Interface

UID

unit identification

USB

universal serial bus

VC

Virtual Connect

VCA

Version Control Agent

VCRM

Version Control Repository Manager

xHCI

Extensible Host Controller Interface

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